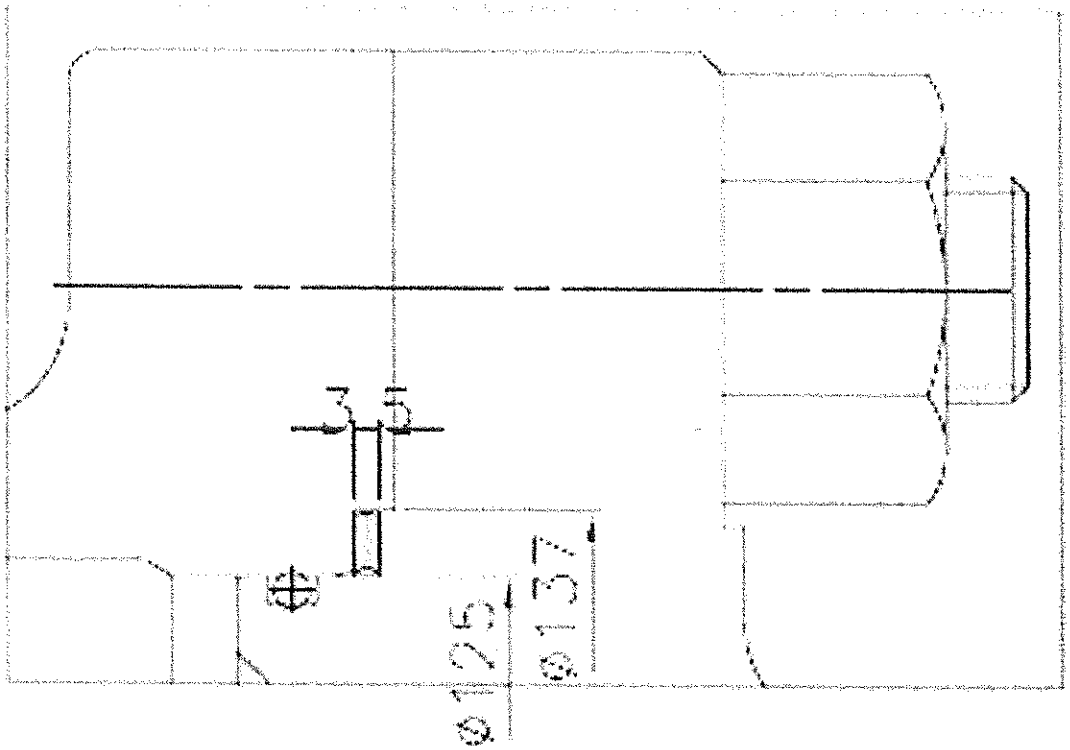
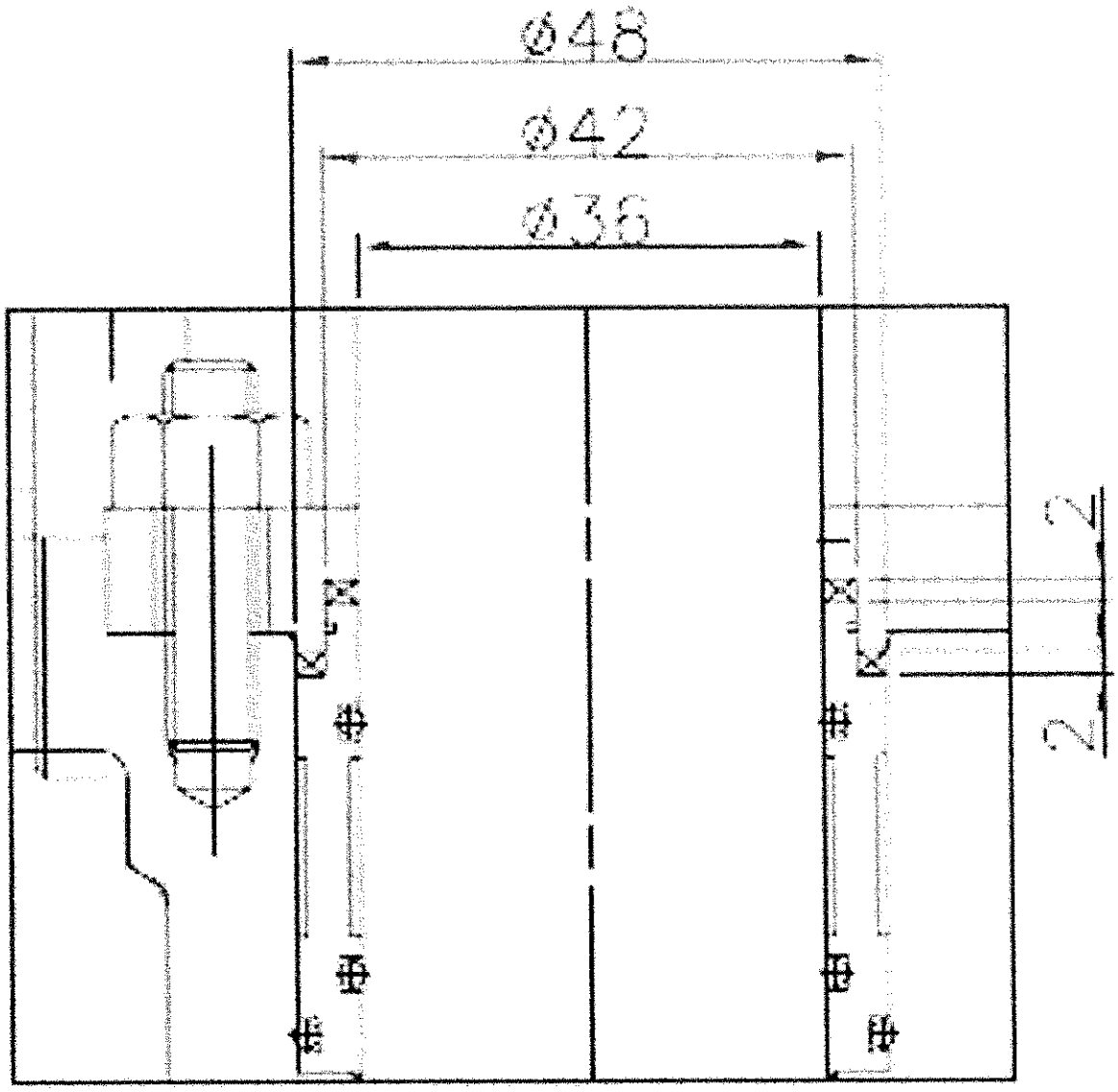


Ball Valve Gasket Area



Ball Valve Packing Area

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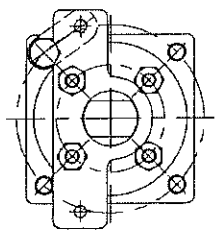

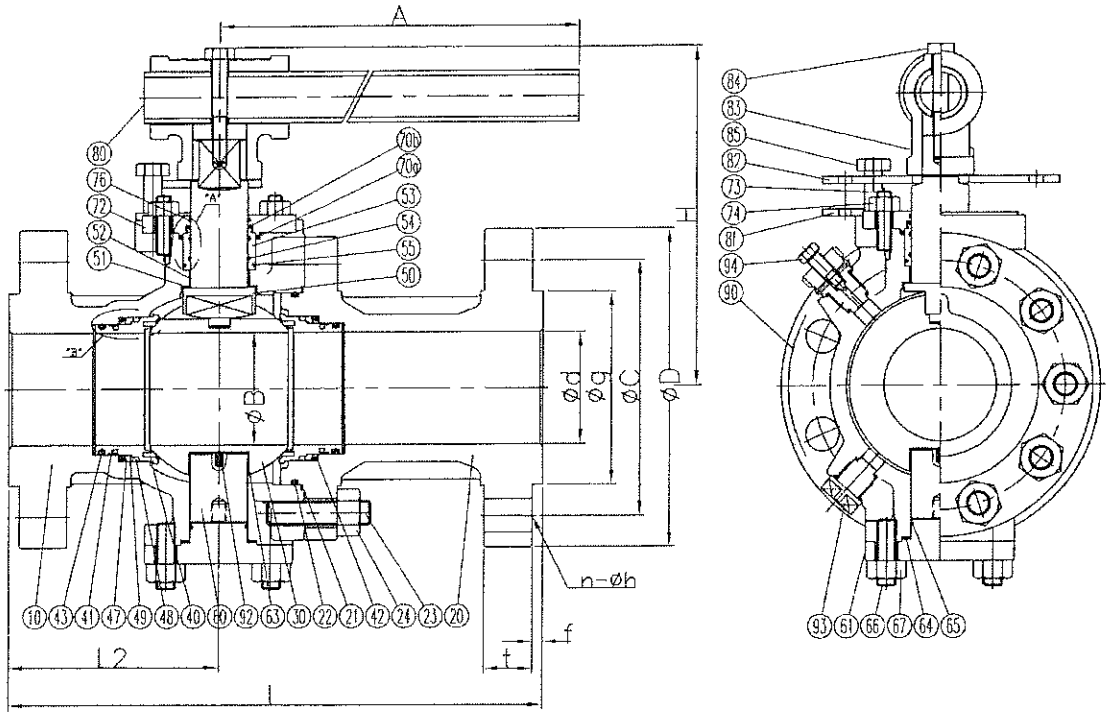

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DATE 03/Feb/2000

ORDER NO. :

BILL OF MATERIALS

NO	DESCRIPTIONS	MATERIAL	REMARK
10	BODY	A216-WCB	
20	CAP	A216-WCB	
21	CAP GASKET	316SPV + GRAPHITE	
22	CAP O-RING	VITON (AED)	
23	CAP BOLT	A193-B7M	
24	CAP NUT	A194-2HM	
39	BALL	A351-CF8M	
40	SEAT	RTFE	
41	SEAT HOLDER	A276-316/A351-CF8M	
42	SEAT SPRING	INCONEL X-750	
43	SEAT O-RING	VITON (AED)	
47	ENERGIZER	A276-316	
48	SEAT FIRE SAFE SEAL	GRAPHITE	
49	SPACER	PTFE	
50	STEM	A276-316	
51	THRUST WASHER	316SS + PTFE	
52	STEM DRY BEARING	316SS + PTFE	
53	STEM BUSHING	A276-316	
54	BUSH INNER O-RING	VITON (AED)	
55	BUSH OUTER O-RING	VITON (AED)	
60	TRUNNION	A276-316	
61	TRUNNION COVER	A105	
63	TRUNNION DRY BEARING	316SS + PTFE	
64	COVER GASKET	316SPV + GRAPHITE	
65	COVER O-RING	VITON (AED)	
66	COVER BOLT	A193-B7M	
67	COVER NUT	A194-2HM	
70a	STEM COVER FIRE SAFE SEAL	GRAPHITE	
70b	STEM FIRE SAFE SEAL	GRAPHITE	
72	STEM COVER	A105	
73	STEM COVER BOLT	A193-B7M	
74	STEM COVER NUT	A194-2HM	
76	WIPER SEAL	NBR	
80	LEVER / T-BAR TUBE	A395 / A53	LEVER OP.
82	STOPPER	A240-316	LEVER OP.
83	T-BAR SOCKET	A395	LEVER OP.
84	LEVER BOLT	A193-B8M	LEVER OP.
85	STOPPER BOLT	A193-B8M	LEVER OP.
87	LOCKING PLATE	A240-316	LEVER OP.
90	NAMEPLATE	A240-316	
92	ANTI STATIC SPRING	INCONEL X-750	
93	DRAIN PLUG	316SS	
94	BLEED VALVE	316SS	

Hydraulic Test	Shell :	2225	Psi(157	Kg/Cm²)
	Back Seat :	1650	Psi(117	Kg/Cm²)
Pneumatic Test	Seat :	80	Psi(6	Kg/Cm²)

Seat Ring	Stellited (#6)
Wedge	Stellited (#6)
Valve Finishing	Phosphatized
End Connection	Socket Weld (ANSI B 16.11)

Rev. No.	Description	REV'D	APP'D
1			

TITLE: CAST STEEL 2-P BALL VALVE
CLASS 600 FLG'D FULL PORT

Refer to	ASME B16.34	Fig No.		D.W.G. No.	07112751-01
Drawn by	I.C.JUNG	Chk'd by	K.H.JUNG	App'd by	H.G.PARK

CLIENT :

S W I Valve Co., Ltd.

SIZE (Inch)	øB	L	L1	L2	A	H	ød	øD	End Connection øg	t	f	øC	n-øh	WEIGHT (kg)	Q'TY (pcs)	Tag No.
2 X 2	49	292	-	120	450	195	49	165	92.1	25.4	7.0	127.0	8-ø19	23		
3 X 3	74	356	-	140	450	240	74	210	127.0	31.8	7.0	168.3	8-ø22	44		
4 X 4	100	432	-	180	600	285	100	275	157.2	38.1	7.0	215.9	8-ø26	72		

Energy & Process

TYPE APPROVAL CERTIFICATE FOR GATE VALVE
No. 940013/3-TC-01

B.V. Job Ref :

Inspection ordered to B.V. by (1) : SWI Valve Co. Ltd.

#1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Manufacturer : SWI Valve Co. Ltd., Korea

(1) the addressee of the original of this certificate ;

Description of the Supply / Subject of inspection :

Product : Forged Steel Gate Valve

Size of Tested Valve : 1"
Material of Tested Valve : ASTM A105N
Class of Tested Valve : #1500
Stem Diameter : 14.6 mm
Tightness class : below 100ppm
Endurance class : 1500cycles
Temperature range : Room temperature to +260°C
Packing Adjustment number : 0

This certificate covers the whole of the supply: ☑ YES (no more inspection planned) ☐ NO (part of the supply still to be inspected)

Scope of the B.V. Survey :

- Witness for Type Test of Fugitive Emission Test

This supply complies with the following applicable document (s) : (2)

- API 622 Type Testing of Process Valve Packing for Fugitive Emissions

(2) and only for parts of the document(s) which concern the certification or the relevant service provided by Bureau Veritas.

List of enclosures: Test Report for Fugitive Emission Test ---------- 3 Pages

(or reference to enclosed list)

The certificate is valid together with enclosures (if listed). Only pages of enclosures (or parts of pages) which are stamped, are considered as part of this certificate.

Marking and Stamping on the items: NONE

Particulars or comments:

This is to certify that the following valves have been inspected by Bureau Veritas and found to be satisfactory in The Fugitive Emission Test in accordance with API 622 First Edition, August 2006.

Date of Issuance : 24-Mar-2011 Issued by :
Date of last inspection : 02 to 04-Mar-2011 Name : K. M. Kim

BUREAU VERITAS SEOUL 4 KOREA

Sign :

Location of inspection : BV-Korea, Seoul Office

This certificate is deliverered within the Scope of the General Conditions of Services of Bureau Veritas
Ce Certificat est délivré dans le cadre des Conditions Générales de Service du Bureau Veritas

This certificate is issued further to an inspection whose duration and scope were limited by the terms and conditions of the contract with BV principal. This certificate is NOT an indication that the item(s) is (are) fit for any specific purpose and does not release the manufacturer, supplier and any party from their respective duty, guarantee, obligation and/or indemnity relating to, without limitation, patents, workmanship, materials, safety, performance in operation and/or reliability.

Ad ME 9613c

PROTOTYPE TEST FOR VALVE
ACCORDING TO API 622 FIRST EDITION , AUGUST 2006.

- Fugitive Emission Test equipment specification

1. Manufacturer : SWI VALVE CO. LTD.
2. Address : 1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea
3. Date of Test : 02nd Mar,2011 to 04th Mar,2011

1. VALVE SPECIFICATION

Valve size & type	GATE Valve A105N/13CRFS RF 1500# BB RB 1"
Material of Valve	A105N
Valve class	1500#
Stem diameter	14.6 mm
Gland packing type	Graphite Braided Packing+Graphite Molded Packing Model No. : PILLAR 6715+ 6610
Packing material	GRAPHITE, GRAPHITE+INCONEL WIRE
Operating torque	51N/m
Stroke	24.3 mm

2. TEST CONDITION

Test pressure	208-256 bar
Test medium	He 99%
Check medium	He 99%
Test temperature	RT/ 260℃
Test equipment	Fugitive emission test equip. manufactured by SWI VALVE CO. LTD.
Leakage measurement equipment	Helium Detector(ALCATEL Model ASM142 series)
Sampling method	Random
Valve repacking before test	0
Insulation of test valve	Heating Jacket used
Actuator	Geared motor

BUREAU VERITAS
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A.1- Fugitive Emissions Test Report Summary

API Std 622

Fugitive Emissions Testing Report Number: SWI- FET-15

Application Profile : Check One ☐ Rotating ☑ Rising	Manufacturer: SWI VALVE CO. LTD. Description: Gate A105 #1500 RF 1"
Testing Facility: SWI Factory Technician: ManJong,Ko Start date: 02ND March,2011 Completion: 04TH March,2011	Source: ☑ Manufacturer Date: 11th Feb,2011 ☐ Distributor Packaged: Indicate New or ☐ New Current Product ☑ Current
Gland Load Information psi. Gland Nut Torque :29 ft-lbs	
Notes concerning installation instructions	

Testing Profile Details

Test Segment	Leak measurement (ppm)	Temperature(℃)	Reference Temperature(℃) at packing gland	Flats Adjusted-Gland Nut Torque ft-lbs	Reference A Height (mm)	
Day1 Start,Ambient 0-250 cycles P=256(bar)	0	Room temp.	Room temp.	29	44.49	
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
	4	Room temp.	Room temp.			
	4	Room temp.	Room temp.			
	2	Room temp.	Room temp.			
High Temperature 250-500cycles P=208(bar)	25	260℃	220℃			
	29	260℃	220℃			
	36	260℃	220℃			
	37	260℃	220℃			
	38	260℃	220℃			
Day2 Start,Ambient 500-750 cycles P=256(bar)	12	Room temp.	Room temp.			
	26	Room temp.	Room temp.			
	29	Room temp.	Room temp.			
	34	Room temp.	Room temp.			
	39	Room temp.	Room temp.			
	42	Room temp.	Room temp.			
High Temperature 750-1000 cycles P=208(bar)	53	260℃	220℃			
	56	260℃	220℃			
	58	260℃	220℃			
	62	260℃	220℃			
	65	260℃	220℃			
Day3 Start,Ambient 1000-1250 cycles P=256(bar)	46	Room temp.	Room temp.			
	43	Room temp.	Room temp.			
	49	Room temp.	Room temp.			
	61	Room temp.	Room temp.			
	69	Room temp.	Room temp.			
	70	Room temp.	Room temp.			
High Temperature 1250-1500cycles P=208(bar)	73	260℃	220℃			
	79	260℃	220℃			
	83	260℃	220℃			
	89	260℃	220℃			
	92	260℃	220℃			

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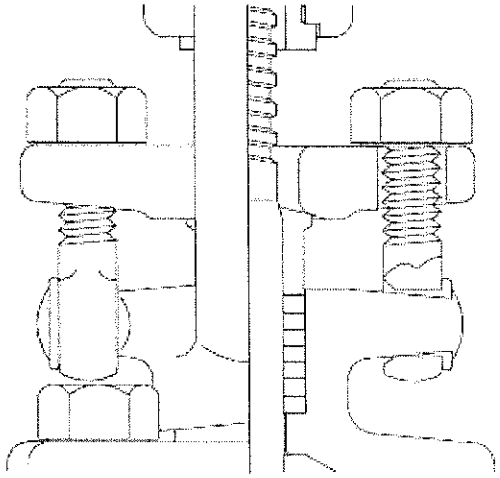
☐ REVIEWED
☑ WITNESSED
DATE 04/Mar/2011

A grqph depicting the test profile with associated leak checks and reajustments shall be provide by the testing authority.

API Std 622 Emissions Testing Report Summary	
Test Number: SWI-FET-15	Test Date: 02ND to 04TH MAR , 2011
Packing Material: Graphite, Graphite+ inconel wire	Style Number:
Packing Manufacturer: PILLAR 6715+ 6610	Source of Sample: GATE A105N/13CRFS RF1500# BB RB 1"
Test Packing Cross-section: Rectangle	Laboratory Name: SWI LABORATORY
	Location of Test: SWI FACTORY
Packing Gland OD and ID(at the packing): OD= 23.9 ID= 14.2	Packing Gland Bolt Diameter= 7.9 mm
Number of Mechanical Cycles: 750	Packing Compression % of Free Height= 80%
	Torque on Gland Nuts(each side)=29/29 (ft-lbs)
Number of Thermal Cycles: 750	Mechanical Cycles Prior to Readjustment: Non-applicable
Maximum Test Pressure: 256 bar	Number of Readjustments: 0
Packing Configuration: Graphite + Graphite with inconel wire Number of rings tested: 7 Circle the following Ring shape(square, circular, vee) Solid or split Braided Die formed Spool stock Wire or other reinforcement Corrosion inhibitor &type Other	Show Sketch of Packing Installation-define each ring: 

TEST CHECKED BY :	TEST APPROVED BY :
Man Jong , Ko	Yong Pyo, Cho
DATE: MAR 16TH , 2011	DATE: : MAR 16TH , 2011

BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE Mar. 16, 2011

Energy & Process

TYPE APPROVAL CERTIFICATE FOR GATE VALVE
No. 940013/3-TC-02

B.V. Job Ref : 3.30.1030.03
Inspection ordered to B.V. by (1) : SWI Valve Co. Ltd.

#1023-2 Gwanyang 1-dong.Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Manufacturer : SWI Valve Co. Ltd., Korea

(1) the addressee of the original of this certificate :

Description of the Supply / Subject of inspection :
Product : Forged Steel Gate Valve
Size of Tested Valve : 1"
Material of Tested Valve : ASTM A105N
Class of Tested Valve : #1500
Stem Diameter : 14.6 mm
Tightness class : BH
Endurance class : CO2(1500cycles)
Temperature class : t400°C
Valves Qualified according to sizes : up to 2" (Stem Dia. : 7.3 to 29.2 mm)
Valves Qualified according to pressure ratings : #150, #300, #600 , #800, #1500
Valves Qualified according to tightness class : BH
Valves Qualified according to Endurance class : CO2(1500cycles)
Valves Qualified according to temperature class : Room temperature to +400°C
This certificate covers the whole of the supply: ☒ YES (no more inspection planned) ☐ NO (part of the supply still to be inspected)

Scope of the B.V. Survey :

- Witness for Type Test of Fugitive Emission Test

This supply complies with the following applicable document (s) : (2)
- ISO 15848-1 Industrial Valves-Measurement, Test and Qualification Procedure for Fugitive Emission
(2) and only for parts of the document(s) which concern the certification or the relevant service provided by Bureau Veritas.

List of enclosures: Test Report for Fugitive Emission Test ---------- 6 Pages

(or reference to enclosed list)
The certificate is valid together with enclosures (if listed). Only pages of enclosures (or parts of pages) which are stamped, are considered as part of this certificate.

Marking and Stamping on the items: NONE

Particulars or comments:
This is to certify that the following valves have been inspected by Bureau Veritas and found to be satisfactory in The Fugitive Emission Test in accordance with ISO 15848-1 Edition2006.

Date of Issuance : 24-Mar-2011 Issued by :
Date of last inspection : 02~03-Mar-2011 Name : K. M. Kim

Sign :
Location of inspection : BV-Korea, Seoul Office

BUREAU VERITAS SEOUL 4 KOREA

This certificate is deliverered within the Scope of the General Conditions of Services of Bureau Veritas
Ce Certificat est délivré dans le cadre des Conditions Générales de Service du Bureau Veritas

This certificate is issued further to an inspection whose duration and scope were limited by the terms and conditions of the contract with BV principal. This certificate is NOT an indication that the item(s) is (are) fit for any specific purpose and does not release the manufacturer, supplier and any party from their respective duty, guarantee, obligation and/or indemnity relating to, without limitation, patents, workmanship, materials, safety performance in operation and/or reliability.

Ad ME 9813c

PROTOTYPE TEST FOR VALVE
ACCORDING TO ISO 15848-1 Edition 2006

- Fugitive Emission Test equipment specification

1. Manufacturer : SWI VALVE CO. LTD.
2. Address : 1023-2 Gwanyang 1-dong,Dongan-gu,
   Anyang-si, Gyeonggi-do, Korea
3. Date of Test : 2nd MAR,2011 to 3rd MAR,2011

1. VALVE SPECIFICATION

Valve size & type	GATE Valve A105N/13CRFS RF 1500# BB RB 1"
Material of Valve	A105N
Valve class	1500#
Stem diameter	14.6 mm
Gland packing type	Graphite Braided Packing+Graphite Molded Packing Model No. : PILLAR 6715+ 6610
Packing material	GRAPHITE, GRAPHITE+INCONEL WIRE
Operating torque	51N/m
Stroke	24.3 mm

2. TEST CONDITION

Test pressure	174-256 bar
Test medium	He 99%
Check medium	He 99%
Test temperature	RT/ 400℃
Test equipment	Fugitive emission test equip. manufactured by SWI VALVE CO. LTD.
Leakage measurement equipment	Helium Detector(ALCATEL Model ASM142 series)
Sampling method	Random
Valve repacking before test	0
Insulation of test valve	Heating Jacket used
Actuator	Geared motor

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3. CONDITION FOR CYCLING TEST

Number of step test cycles	4
Number of cycles for step	125
Number of step test cycles	2
Number of cycles for step	500
Number of step cycles at high temperature	3
The duration of the cycle stroke	14sec. (open 2" +stem movement 8"+close 2")

4. DOCUMENTATION USED

Industrial Valves- Measurement test and qualification procedures for fugitive emission Spec. ISO 15848-1 Edition 2006.

5. TEST RESULTS

Test results are recorded in manufactures test report from next page.

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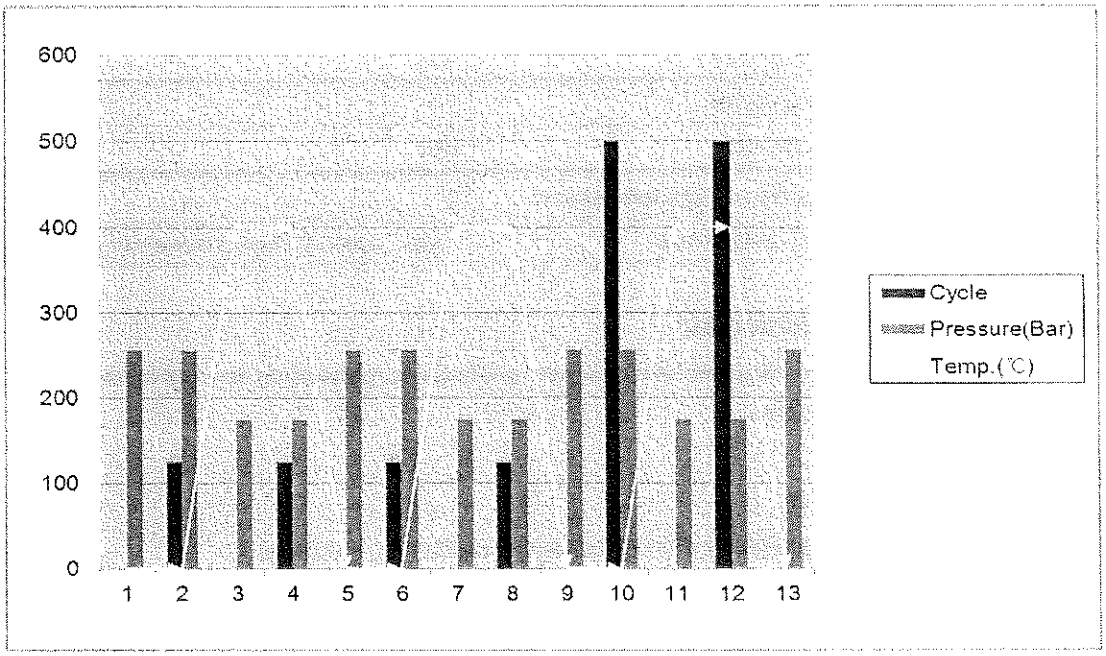
DATE 9/NOV/2011

6. TEST STEPS

The below graph specifies fluctuation of the 3 factors over total of 13 test steps.



7. TEST TABLE

The following table describes total of 13 steps and leakage rates in order.

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DATE 03/Mar./2011

TEST FROM ROOM TEMPERATURE(-29℃ ~+40℃) to +400℃.

Step 1. PRELIMINERY TESTS AT THE ROOM TEMPERATURE

Pres.(BAR)	Body Temp.(℃)	Body-Bonnet Leakage(PPM)	Packing leakage (atm x cm^3 x s^{-1})
256	Room. Temp.	0	5.8×10^{-6}

Step 2. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	256	Room. Temp.	7.5×10^{-6}

Step 3. STATIC TEST AT THE SELECTED TEST TEMPERATURE 400℃

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
174	400	$8.8x10^{-6}$

Step 4. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 400℃

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	174	400	$9.3 x10^{-6}$

Step 5. INTERMEIATE STATIC TESTS AT THE ROOM TEMPERATURE

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
256	Room. Temp.	$8.6x10^{-6}$

Step 6. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	256	Room. Temp.	$9.3 x10^{-6}$

Step 7. STATIC TEST AT THE SELECTED TEST TEMPERATURE 400℃

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
174	400	$1.2 x10^{-5}$

Step 8. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 400℃

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	174	400	$1.4 x10^{-8}$

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DATE 03/mar./2011

- In this point, One Packing adjustment is taken for re-tightening.

Step 9. INTERMEIATE STATIC TESTS AT THE ROOM TEMPERATURE

Pres.(BAR)	Body Temp.(℃)	Packing leakage	**Packing torque Nm**
256	Room temp.	$9.7 x10^{-6}$	39

Step 10. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
500	256	Room. Temp.	1.1 x10^{-5}

Step 11. STATIC TEST AT THE SELECTED TEST TEMPERATURE 400℃

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
174	400	1.2 x10^{-5}

Step 12. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 400℃

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
500	174	400	1.6x10^{-5}

Step 13. FINAL TEST AT THE ROOM TEMPERAURE

Pres.(BAR)	Body Temp.(℃)	Body-Bonnet leakage(PPM)	Packing leakage (atm x cm^3 x s^{-1})
256	Room Temp.	36	9.7 x10^{-6}

POST TEST EXAMINATION

No visible damage or wear on stem packing area

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DATE 03/MAR/2011

ACCEPTANCE TIGHTNESS CLASS

	CLASS B
Body & bonnet gasket seal	≤50 ppmv
Stuffing box stem seal	$\leq 10^{-4}(mg x s^{-1} x m^{-1})$ Equivalent to $\leq 5.6 x 10^{-4}(atm \times cm^3 \times s^{-1})$

Maximum allowable tightness leakages based on actual dimensions of stuffing box packing seals with :

- stuffing box packing seal : stem diameter 14.6 mm

	CLASS B
Stuffing box stem seal	Stem diameter(0.0146m) xπx5.6x 10^{-4} $(atm \times cm^3 \times s^{-1})$ = 2.57 x10^{-5} $(atm \times cm^3 \times s^{-1})$

Conclusion : values observed quality valve to :

TIGHTNESS CLASS : BH

With one packing adjusted**<SSA1>** for re tightening

ENDURANCE CLASS :

CO2 1,500 cycles

TEMPERAUTRE CLASS:

Room temperature to 400℃

Performance class : **ISO FE BH- CO2 – SSA1 – t- (400℃)-CL800- ISO 15848-1**

BUREAU VERITAS
REVIEWED
WITNESSED
DATE

TEST CHECKED BY :	TEST APPROVED BY :
Man Jong , Ko	Yong Pyo, Cho
DATE: MAR 16TH , 2011	DATE: : MAR 16TH , 2011

SWI Valve Co., Ltd.
Head office & Plant 1 : 1023-2 Gwanyang-dong, Dongan-gu,
Anyang-si, Gyeonggi-do, Korea Tel +82 31 421 1831~3 Fax +82 31 421 1834
Plant 2 : 601-1 Goryeom-ri, Cheongbuk-myeon, Pyeongtaek-si, Gyeonggi-do, Korea
Tel +82 31 684 2981~3 Fax +82 31 684 2984 www.swivalve.com

TEST/INSPECTION CERTIFICATE

DATE : 2011. 02. 11

SWI ORDER NO. : SO2010100089

CERTIFICATE NO. : 100089-3

PROJECT NAME / NO: Fugitive Emission Test Sample

CUSTOMER/CLIENT : SWI Valve Co., Ltd.

PO NO.:

TAG NO.	ITEM DESCRIPTION	Class Press -ure	SIZE (inch)	Q'ty	Hydrostatic Test (kg/cm^2)		Air Test (kg/cm^2)	Materials(ASTM)				Dimen -sion Check	Visual Inspe -ction	Functi -onal Test	Result
					Shell	Seat / Backseat	Seat	Body & Bonnet	Seat Ring (Seat)	Stem	Wedge/ Disc (Ball)				
	GATE V/V RF	1500#	1"	1	392	N.A/289	6	A105N	A276-410/HF	A276-410	A217-CA15/HF	GOOD	GOOD	GOOD	ACCEPTED

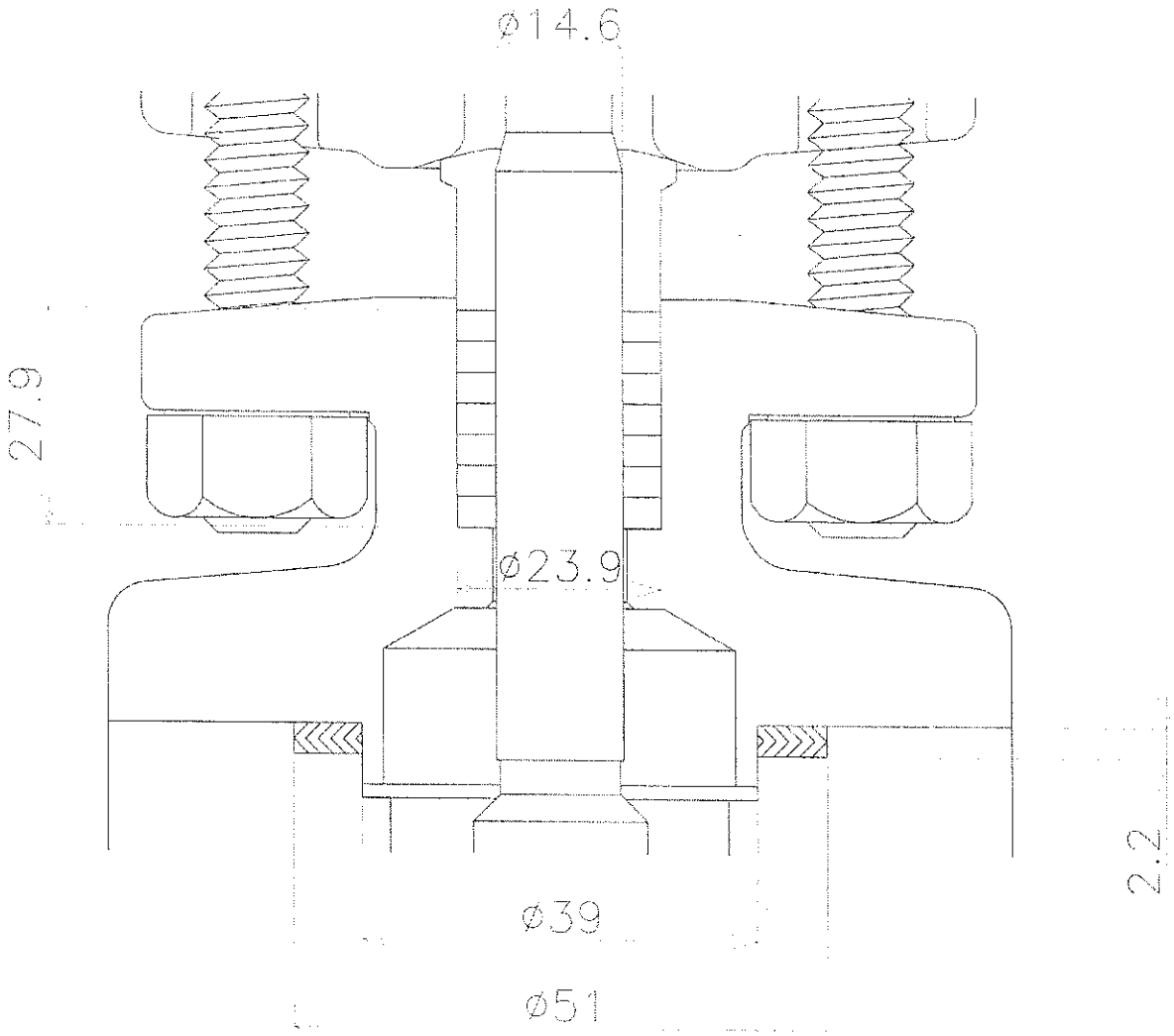
Remarks 1. These standard for inspection conform to API 598
2. HF : STELLITE NO. 6 Hard Facing

BUREAU VERITAS
REVIEWED
WITNESSED
DATE 03/Mar./2011

Witnessed / Reviewed by Customer Rep.

Q.A Manager

WE HEREBY CERTIFY THAT THE RESULTS MENTIONED ABOVE ARE TRUE AND CORRECT IN EVERY DETAIL



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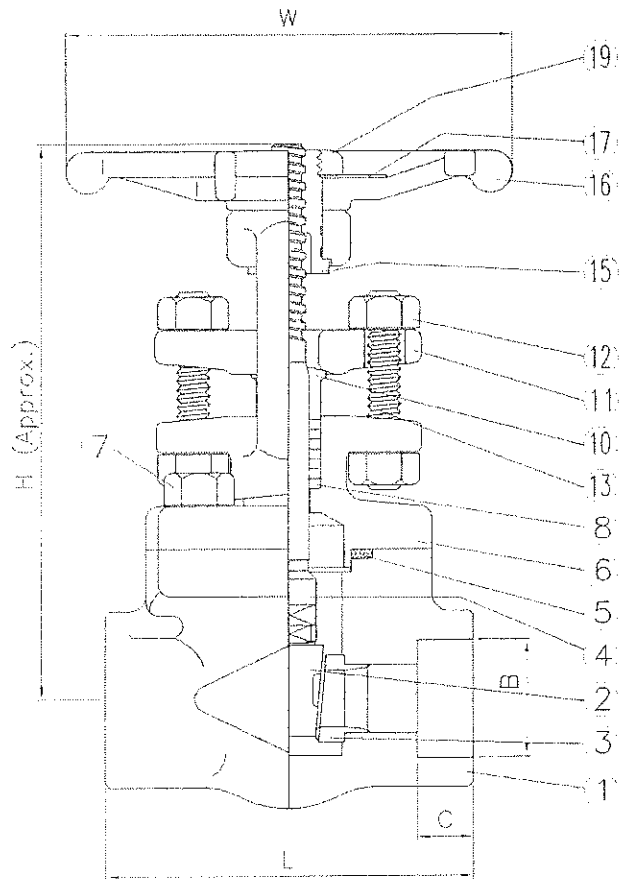
☐ WITNESSED
DATE 03 MAR 2011

GATE



SIZE (Inch)	H (Open)	L	W	Port Dia.	End Connection B	End Connection C	Weight (Kg)	Q'TY (pcs)	Valve No.
1/4	153	86	102	6.4	14.10	9.7	2.2		
3/8	153	86	102	9.5	17.55	9.7	2.1		
1/2	153	86	102	9.5	21.75	9.7	2.0		
3/4	186	102	114	12.7	27.10	12.7	3.4		
1	238	117	140	18.0	33.80	12.7	5.8		
1-1/4	267	133	165	31.0	42.55	12.7	8.7		
1-1/2	267	133	165	31.0	48.65	12.7	8.5		
2	318	210	184	37.0	61.15	15.8	11.7		

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WITNESSED
DATE 03/JULY/1998

ORDER NO. :

BILL OF MATERIALS

NO.	PARTS	MATERIALS	A.S.T.M
1	Body	Forged Steel	A105
2	Wedge	13Cr Stainless steel	A217-CA15
3	Seat Ring	13Cr Stainless steel	A276-410
4	Stem	13Cr Stainless steel	A276-410
5	Gasket	304 Hoop + Graphite	
6	Bonnet	Forged Steel	A105
7	Bonnet Bolt	Alloy Steel	A193-B7
8	Gland Packing	Graphite + Carbon Fiber	
10	Gland	Stainless Steel	A276-316
11	Gland Flange	Forged Steel	A105
12	Gland Nut	Carbon Steel	A194-2H
13	Gland Bolt	Alloy Steel	A193-B7
15	Yoke Sleeve	13Cr Stainless Steel	A276-410
16	Handwheel	Malleable Iron	A47
17	Name Plate	Aluminum	
19	Handwheel Nut	Carbon Steel	A563A

Hydraulic Test	Shell	:	5575	Psi(392	Kg/Cm²)
	Back Seat	:	4100	Psi(289	Kg/Cm²)
Pneumatic Test	Seat	:	80	Psi(6	Kg/Cm²)

Seat Ring	Stellited (#6)
Wedge	Stellited (#6)
Valve Finishing	Phosphatized
End Connection	Socket Weld (ASME B16.11)

Rev. No.	Description	REV'D	APP'D
3			
2			
1			

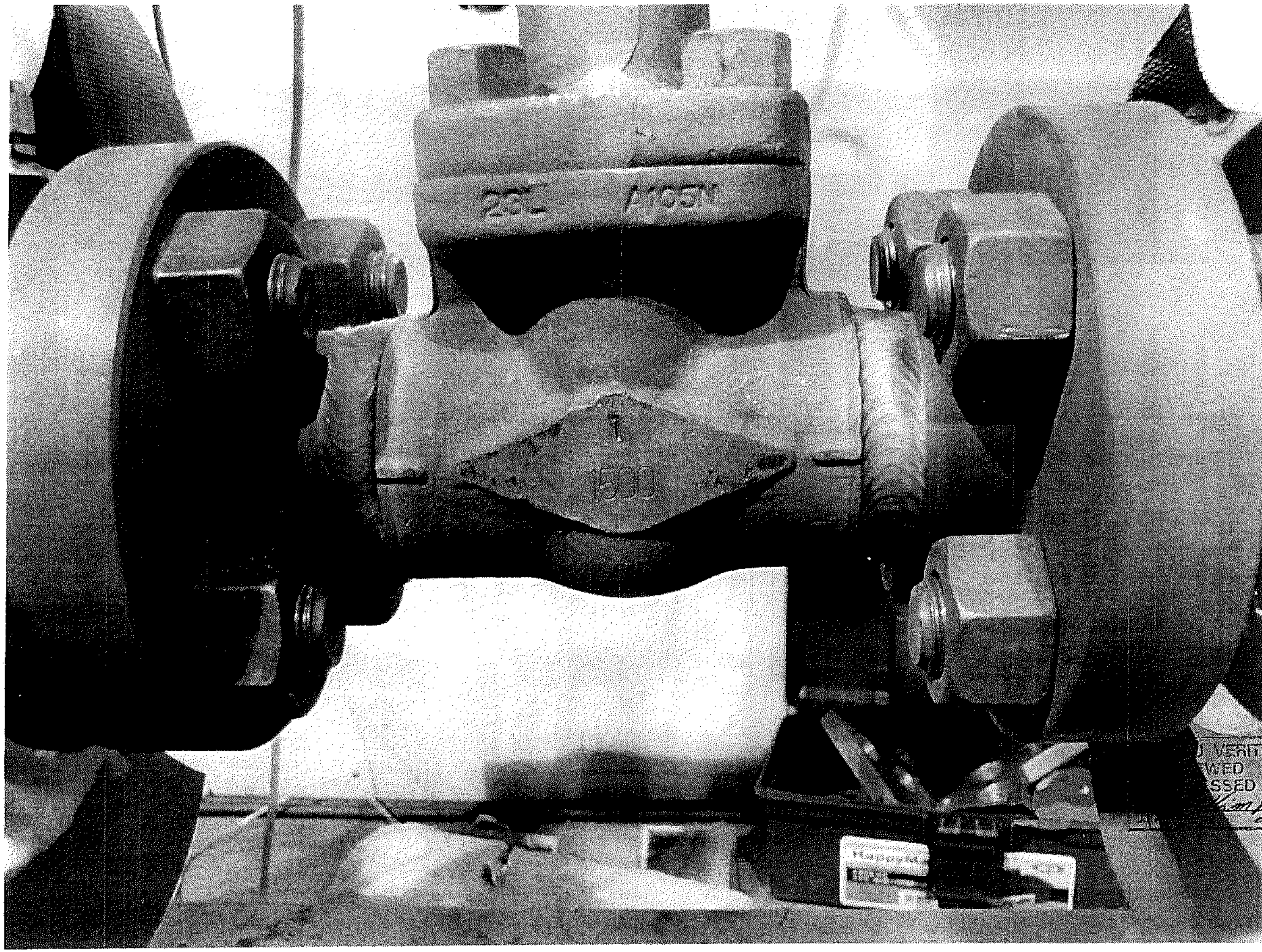
TITLE FORGED STEEL GATE VALVE CLASS 1500
BB OS & Y S.W REDUCED PORT

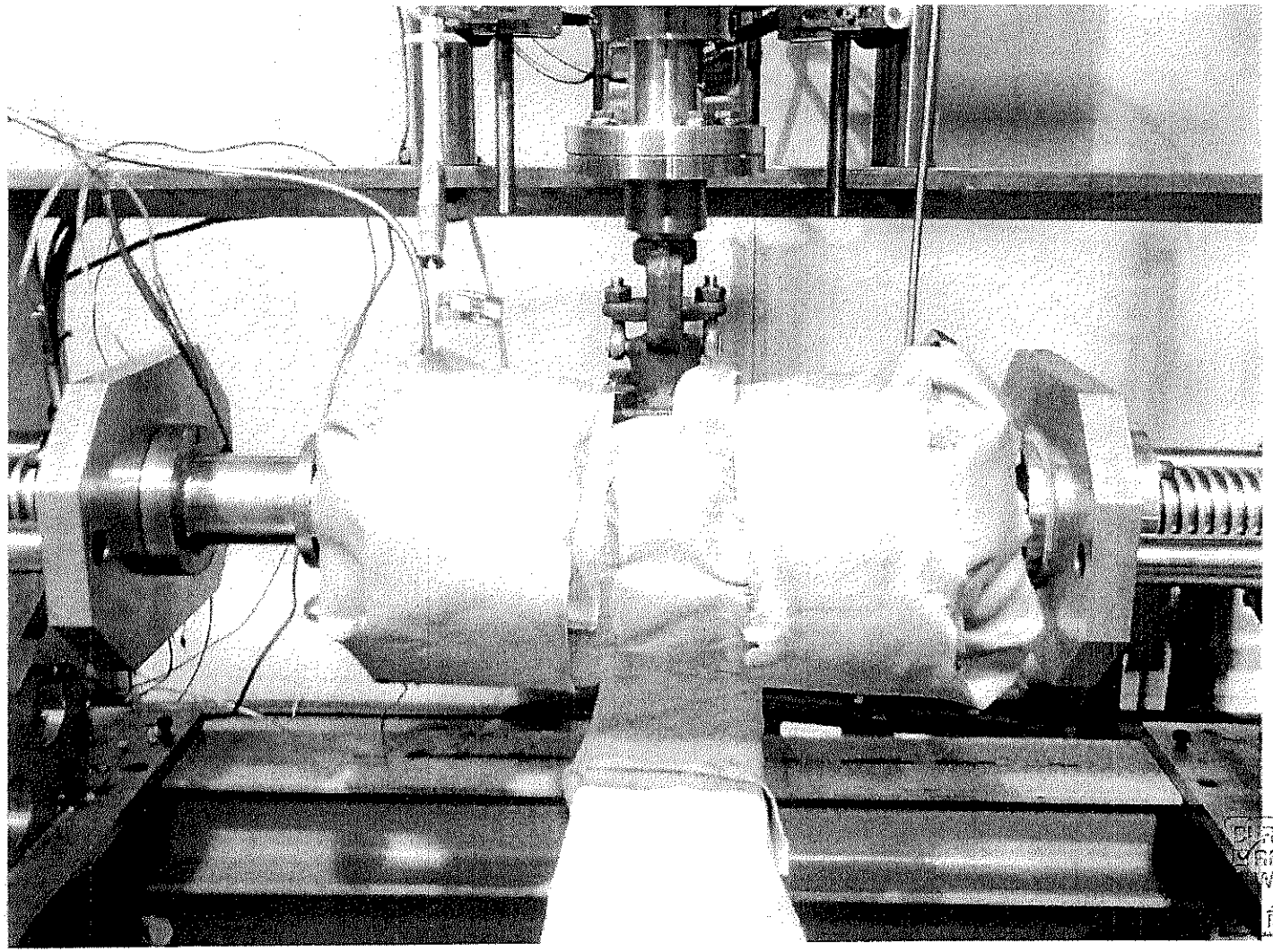
Refer to API 602 Fig No. D.W.G. No. 110196-01

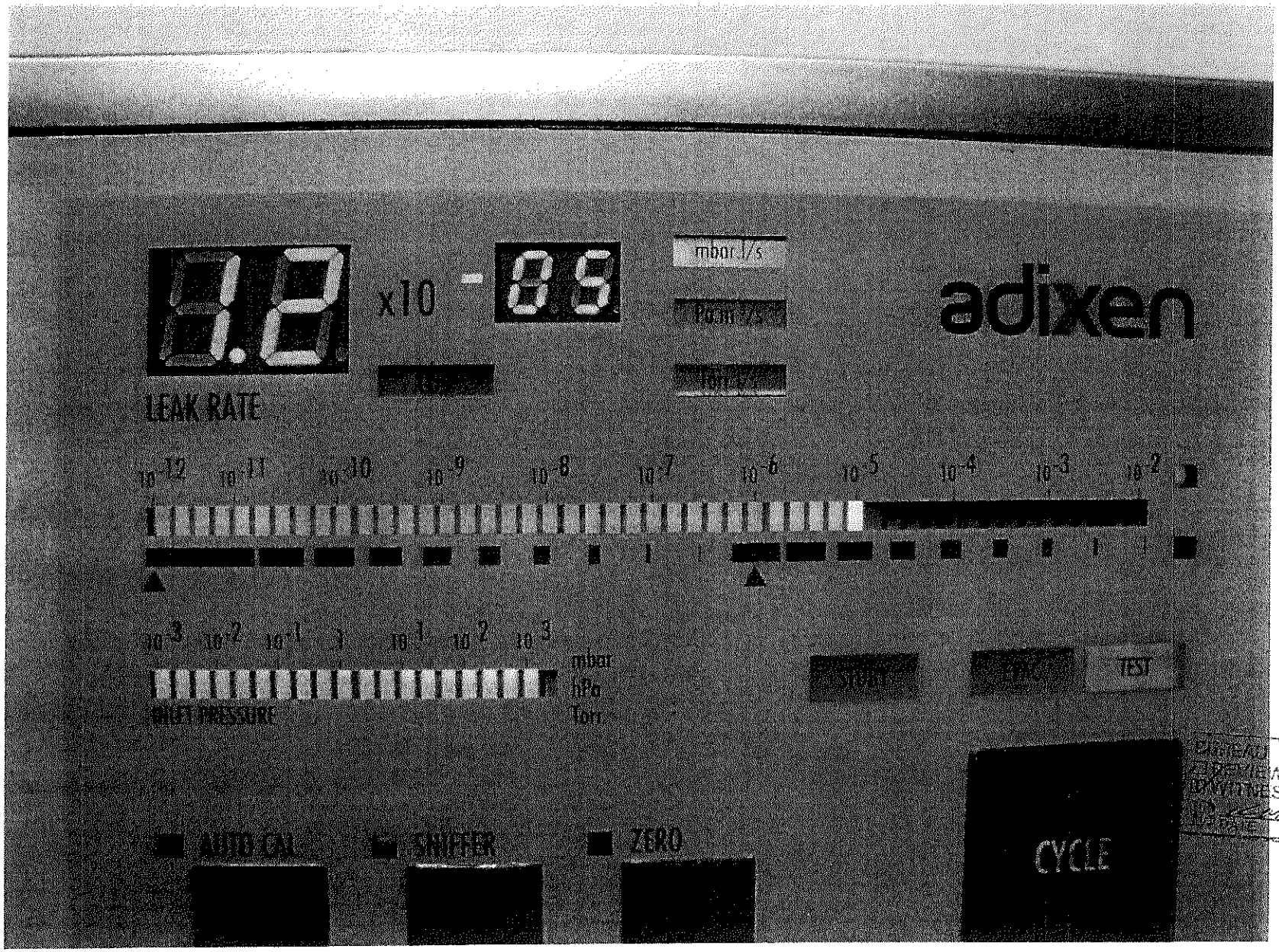
Drawn by J.B.CHOI Chk'd by K.H.JUNG App'd by K.H.JUNG

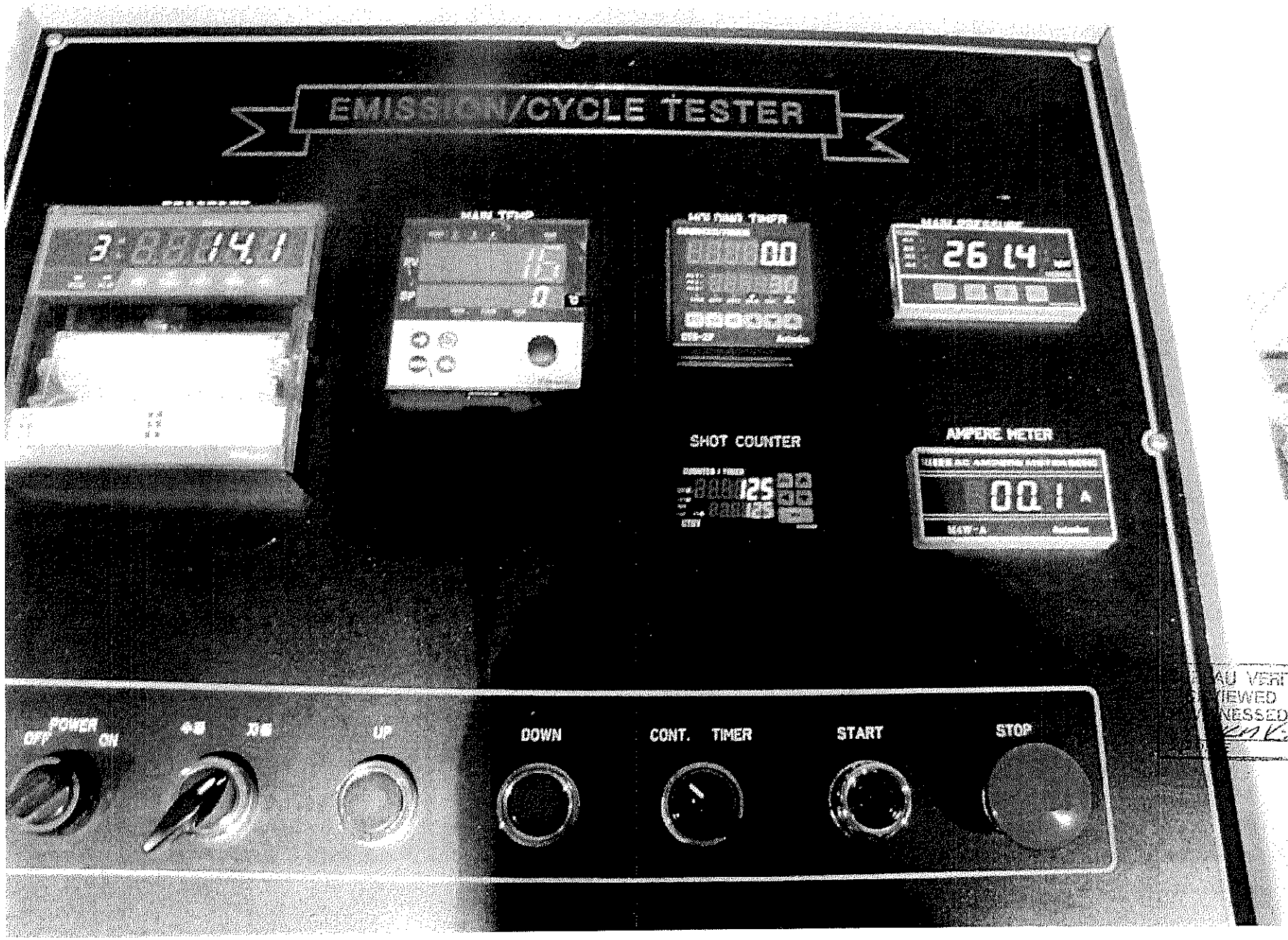
CLIENT :

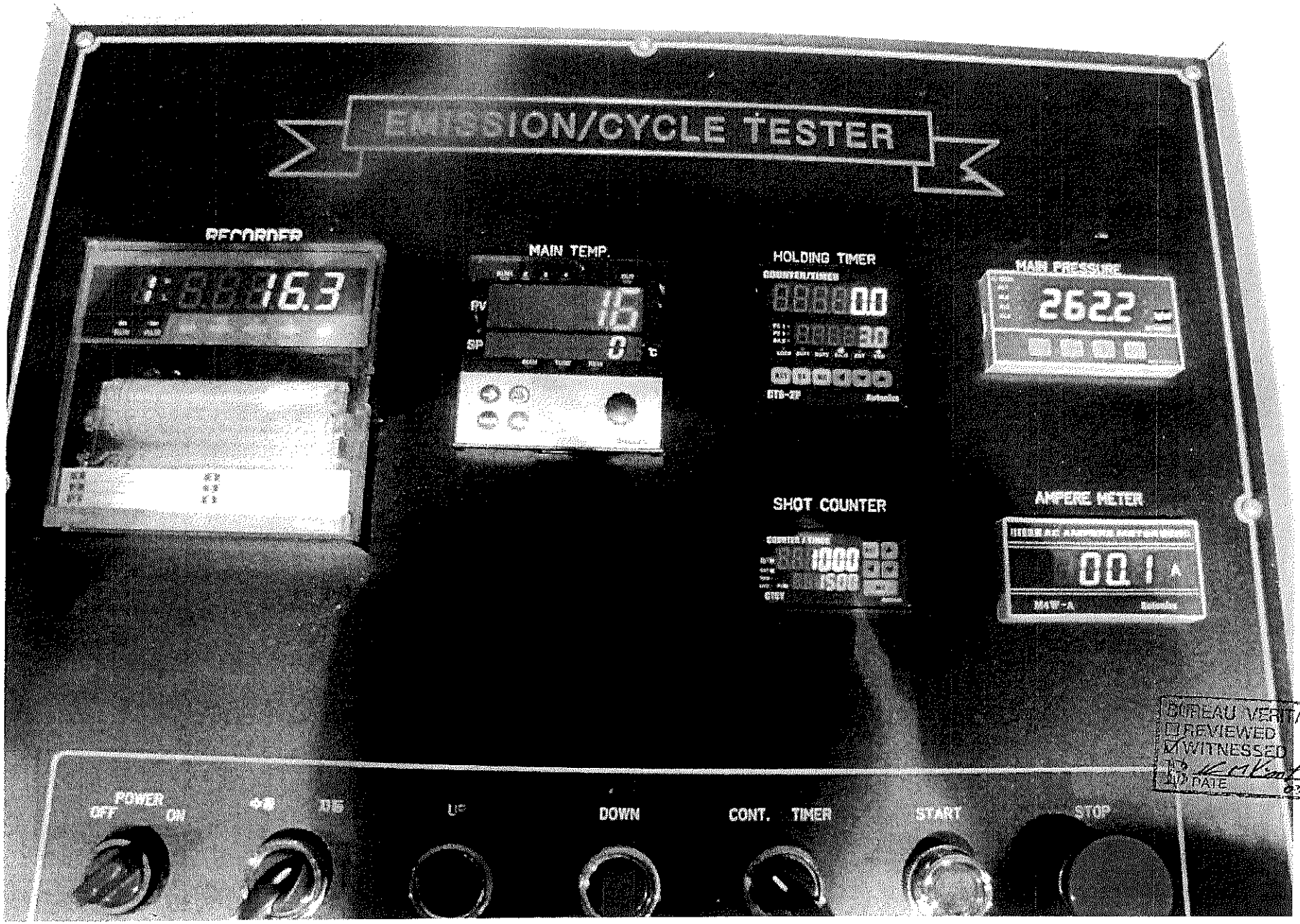
S W I Valve Co., Ltd.

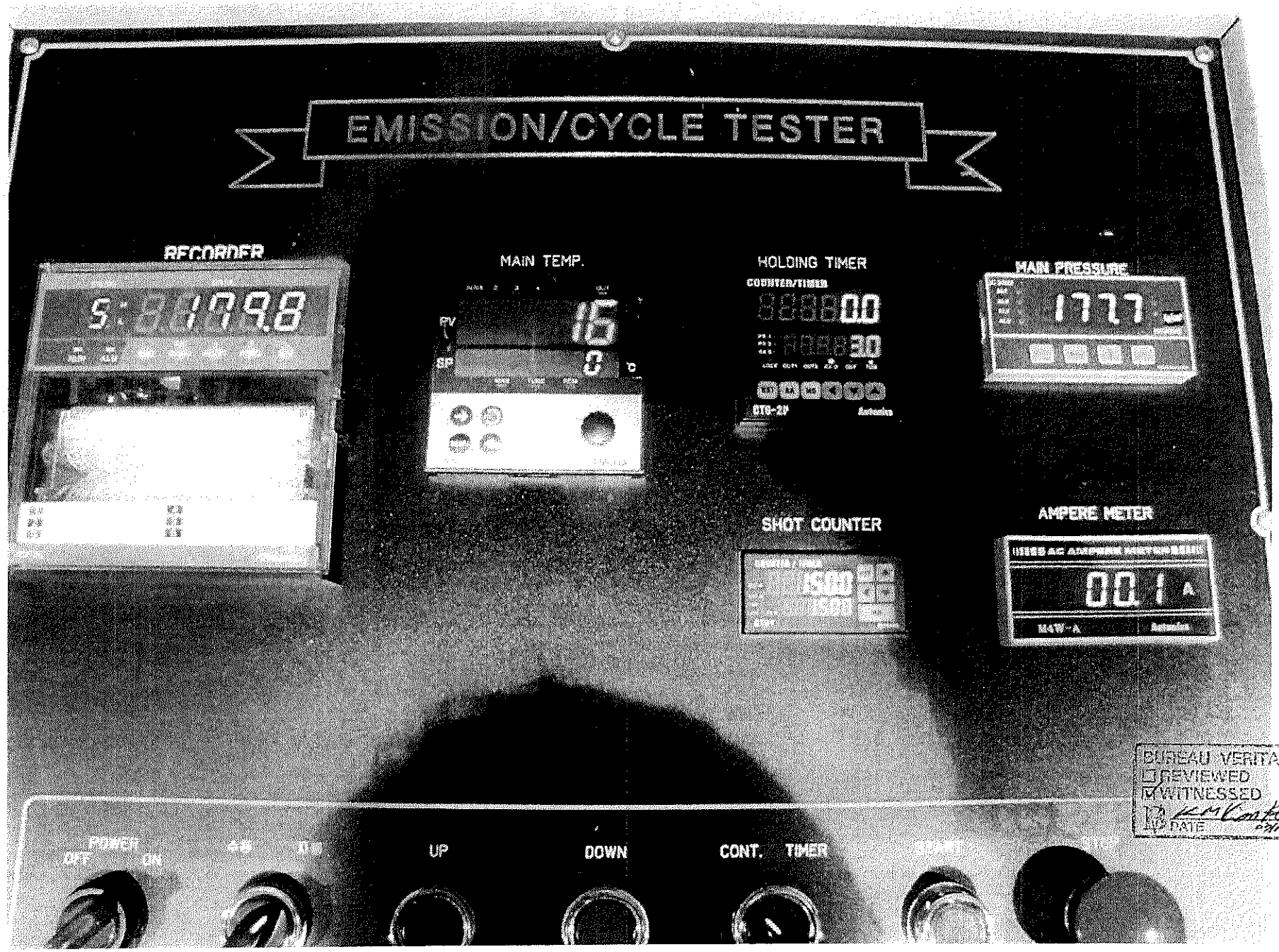












BUREAU VERITAS
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DATE

Energy & Process

TYPE APPROVAL CERTIFICATE FOR GLOBE VALVE
No. 940013/3-TC-03

B.V. Job Ref :3.30.1030.03
Inspection ordered to B.V. by (1) : SWI Valve Co. Ltd.

#1023-2 Gwanyang 1-dong,Dongan-gu Anyang-si. Gyeonggi-do, Korea

Manufacturer : SWI Valve Co. Ltd., Korea

(1) the addressee of the original of this certificate :

Description of the Supply / Subject of inspection :
Product : Forged Steel Globe Valve
Size of Tested Valve : 1"
Material of Tested Valve : ASTM A105N
Class of Tested Valve : #1500
Stem Diameter : 16.0 mm
Tightness class : below 100ppm
Endurance class : 1500cycles
Temperature range : Room temperature to +260°C
Packing Adjustment number : 0

This certificate covers the whole of the supply: ☒ YES (no more inspection planned) ☐ NO (part of the supply still to be inspected)

Scope of the B.V. Survey :

- Witness for Type Test of Fugitive Emission Test

This supply complies with the following applicable document (s) : (2)
- API 622 Type Testing of Process Valve Packing for Fugitive Emissions

(2) and only for parts of the document(s) which concern the certification or the relevant service provided by Bureau Veritas.

List of enclosures: Test Report for Fugitive Emission Test ---------- 3 Pages

(or reference to enclosed list)
The certificate is valid together with enclosures (if listed). Only pages of enclosures (or parts of pages) which are stamped, are considered as part of this certificate

Marking and Stamping on the items: NONE

Particulars or comments:
This is to certify that the following valves have been inspected by Bureau Veritas and found to be satisfactory in The Fugitive Emission Test in accordance with API 622 First Edition, August 2006.

Date of Issuance : 24-Mar-2011 Issued by :
Date of last inspection : 18 to 20-Feb-2011 Name : K. M. Kim
Sign :
Location of inspection : BV-Korea, Seoul Office

BUREAU VERITAS SEOUL

This certificate is delivererd within the Scope of the General Conditions of Services of Bureau Veritas
Ce Certificat est délivré dans le cadre des Conditions Générales de Service du Bureau Veritas

Ad ME 9513b

PROTOTYPE TEST FOR VALVE
ACCORDING TO API 622 FIRST EDITION , AUGUST 2006.

- Fugitive Emission Test equipment specification

1. Manufacturer : SWI VALVE CO. LTD.
2. Address : 1023-2 Gwanyang 1-dong,Dongan-gu,
   Anyang-si, Gyeonggi-do, Korea
3. Date of Test : 18th Feb,2011 to 20th Feb,2011

1. VALVE SPECIFICATION

Valve size & type	GLOBE Valve A105N/13CRFS RF 1500# BB RB 1"
Material of Valve	A105N
Valve class	800#
Stem diameter	16.0 mm
Gland packing type	Graphite Braided Packing+Graphite Molded Packing Model No. : PILLAR 6715+ 6610
Packing material	GRAPHITE, GRAPHITE+INCONEL WIRE
Operating torque	51 N/m
Stroke / Angle	7.8 mm

2. TEST CONDITION

Test pressure	208-256 bar
Test medium	He 99%
Check medium	He 99%
Test temperature	RT/ 260℃
Test equipment	Fugitive emission test equip. manufactured by SWI VALVE CO. LTD.
Leakage measurement equipment	Helium Detector(ALCATEL Model ASM142 series)
Sampling method	Random
Valve repacking before test	0
Insulation of test valve	Heating Jacket used
Actuator	Geared motor

BUREAU VERITAS
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DATE

A.1- Fugitive Emissions Test Report Summary

API Std 622

Fugitive Emissions Testing Report Number: SWI-FET-17

Application Profile : Check One ☐ Rotating ☑ Rising	Manufacturer: SWI VALVE CO. LTD. Description: Globe A105 1500# RF 1"
Testing Facility: SWI Factory Technician: ManJong, Ko Witness: Ki-Man , Kim Start date: 18TH FEB,2011 Completion: 20TH FEB,2011	Source: ☑ Manufacturer Date: 7th FEB,2011 ☐ Distributor Packaged: Indicate New or ☐ New Current Product ☑ Current
Gland Load Information psi. Gland Nut Torque : 28 ft-lbs	
Notes concerning installation instructions	

Testing Profile Details

Test Segment	Leak measurement (ppm)	Temperature(℃)	Reference Temperature(℃) at packing gland	Flats Adjusted-Gland Nut Torque ft-lbs	Reference A Height (mm)	
Day1 Start,Ambient 0-250 cycles P=256(bar)	0	Room temp.	Room temp.	28	44.5	
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
	4	Room temp.	Room temp.			
	4	Room temp.	Room temp.			
	6	Room temp.	Room temp.			
High Temperature 250-500cycles P=208(bar)	22	260℃	220℃			
	27	260℃	220℃			
	35	260℃	220℃			
	36	260℃	220℃			
	38	260℃	220℃			
Day2 Start,Ambient 500-750 cycles P=256(bar)	10	Room temp.	Room temp.			
	22	Room temp.	Room temp.			
	24	Room temp.	Room temp.			
	31	Room temp.	Room temp.			
	36	Room temp.	Room temp.			
	41	Room temp.	Room temp.			
High Temperature 750-1000 cycles P=208(bar)	49	260℃	220℃			
	52	260℃	220℃			
	52	260℃	220℃			
	57	260℃	220℃			
	59	260℃	220℃			
Day3 Start,Ambient 1000-1250 cycles P=256(bar)	43	Room temp.	Room temp.			
	45	Room temp.	Room temp.			
	46	Room temp.	Room temp.			
	55	Room temp.	Room temp.			
	57	Room temp.	Room temp.			
	62	Room temp.	Room temp.			
High Temperature 1250-1500cycles P=208(bar)	68	260℃	220℃			
	72	260℃	220℃			
	78	260℃	220℃			
	79	260℃	220℃			
	85	260℃	220℃			

A grqph depicting the test profile with associated leak checks and reajustments shall be provide by the testing authority.

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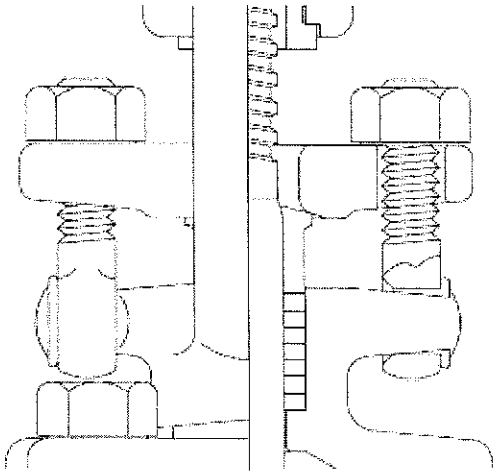
DATE 20 FEB 2011

API Std 622 Emissions Testing Report Summary	
Test Number: SWI-FET-17	Test Date: 18th to 20th FEB , 2011
Packing Material: Graphite, Graphite+ inconel wire	Style Number:
Packing Manufacturer: PILLAR 6715+ 6610	Source of Sample: GLOBE A105N/13CRFS RF BB RB 1500# 1"
Test Packing Cross-section: Rectangle	Laboratory Name: SWI LABORATORY
	Location of Test: SWI FACTORY
Packing Gland OD and ID(at the packing): OD= 25.5 ID= 15.9	Packing Gland Bolt Diameter= 7.9 mm
Number of Mechanical Cycles: 750	Packing Compression % of Free Height= 80%
	Torque on Gland Nuts(each side)= 28/28 (ft-lbs)
Number of Thermal Cycles: 750	Mechanical Cycles Prior to Readjustment: Non-applicable
Maximum Test Pressure: 256 bar	Number of Readjustments: 0
Packing Configuration: Graphite + Graphite with inconel wire Number of rings tested: 7 Circle the following Ring shape(square, circular, vee) Solid or split Braided Die formed Spool stock Wire or other reinforcement Corrosion inhibitor &type Other	Show Sketch of Packing Installation-define each ring: 

TEST CHECKED BY :	TEST APPROVED BY :
Man Jong , Ko	Yong Pyo, Cho
DATE: MAR 16TH , 2011	DATE: : MAR 16TH , 2011

BUREAU VERITAS
REVIEWED
WITNESSED
DATE 20/Feb/2011

Energy & Process

TYPE APPROVAL CERTIFICATE FOR GLOBE VALVE
No. 940013/3-TC-04

B.V. Job Ref :3.30.1030.03

Inspection ordered to B.V. by (1) : SWI Valve Co. Ltd.

#1023-2 Gwanyang 1-dong,Dongan-gu Anyang-si, Gyeonggi-do, Korea

Manufacturer : SWI Valve Co. Ltd., Korea

(1) the addressee of the original of this certificate :

Description of the Supply / Subject of inspection :

Product : Forged Steel Globe Valve

Size of Tested Valve : 1"
Material of Tested Valve : ASTM A105N
Class of Tested Valve : #1500
Stem Diameter : 16.0 mm
Tightness class : BH
Endurance class : CO2(1500cycles)
Temperature class : t400°C
Valves Qualified according to sizes : up to 2" (Stem Dia. : 8.0 to 32.0 mm)
Valves Qualified according to pressure ratings : #150, #300, #600 , #800 #1500
Valves Qualified according to tightness class : BH
Valves Qualified according to Endurance class : CO2(1500cycles)
Valves Qualified according to temperature class : Room temperature to +400°C

This certificate covers the whole of the supply: ☒ YES (no more inspection planned) ☐ NO (part of the supply still to be inspected)

Scope of the B.V. Survey :

- Witness for Type Test of Fugitive Emission Test

This supply complies with the following applicable document (s) : (2)

- ISO 15848-1 Industrial Valves-Measurement, Test and Qualification Procedure for Fugitive Emission

(2) and only for parts of the document(s) which concern the certification or the relevant service provided by Bureau Veritas.

List of enclosures: Test Report for Fugitive Emission Test ---------- 6 Pages

(or reference to enclosed list)
The certificate is valid together with enclosures (if listed). Only pages of enclosures (or parts of pages) which are stamped are considered as part of this certificate

Marking and Stamping on the items: NONE

Particulars or comments:

This is to certify that the following valves have been inspected by Bureau Veritas and found to be satisfactory in The Fugitive Emission Test in accordance with ISO 15848-1 Edition 2006.

Date of Issuance : 24-Mar-2011 Issued by :
Date of last inspection : 18 to 19-Feb-2011 Name : K. M. Kim

Sign :

Location of inspection : BV-Korea, Seoul Office

BUREAU VERITAS SEOUL 4 KOREA

This certificate is deliverered within the Scope of the General Conditions of Services of Bureau Veritas
Ce Certificat est délivré dans le cadre des Conditions Générales de Service du Bureau Veritas

This certificate is issued further to an inspection whose duration and scope were limited by the terms and conditions of the contract with BV principal. This certificate is NOT an indication that the item(s) is (are) fit for any specific purpose and does not release the manufacturer, supplier and any party from their respective duty, guarantee, obligation and/or indemnity relating to, without limitation, patents, workmanship, materials, safety performance in operation and/or reliability.

Ad ME 9613b

PROTOTYPE TEST FOR VALVE
ACCORDING TO ISO 15848-1 Edition 2006

- Fugitive Emission Test equipment specification

1. Manufacturer : SWI VALVE CO. LTD.
2. Address : 1023-2 Gwanyang 1-dong,Dongan-gu,
   Anyang-si, Gyeonggi-do, Korea
3. Date of Test : 18th FEB,2011 to 19th FEB,2011

1. VALVE SPECIFICATION

Valve size & type	GLOBE Valve A105N/13CRFS RF 1500# BB RB 1"
Material of Valve	A105N
Valve class	1500#
Stem diameter	16.0 mm
Gland packing type	Graphite Braided Packing+Graphite Molded Packing Model No. : PILLAR 6715+ 6610
Packing material	GRAPHITE, GRAPHITE+INCONEL WIRE
Operating torque	51 N/m
Stroke / Angle	7.8mm

2. TEST CONDITION

Test pressure	174-256 bar
Test medium	He 99%
Check medium	He 99%
Test temperature	RT/ 400℃
Test equipment	Fugitive emission test equip. manufactured by SWI VALVE CO. LTD.
Leakage measurement equipment	Helium Detector(ALCATEL Model ASM142 series)
Sampling method	Random
Valve repacking before test	0
Insulation of test valve	Heating Jacket used
Actuator	Geared motor

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DATE

3. CONDITION FOR CYCLING TEST

Number of step test cycles	4
Number of cycles for step	125
Number of step test cycles	2
Number of cycles for step	500
Number of step cycles at high temperature	3
The duration of the cycle stroke	14sec. (open 2" +stem movement 8"+close 2")

4. DOCUMENTATION USED

Industrial Valves- Measurement test and qualification procedures for fugitive emission Spec. ISO 15848-1 Edition 2006.

5. TEST RESULTS

Test results are recorded in manufactures test report from next page.

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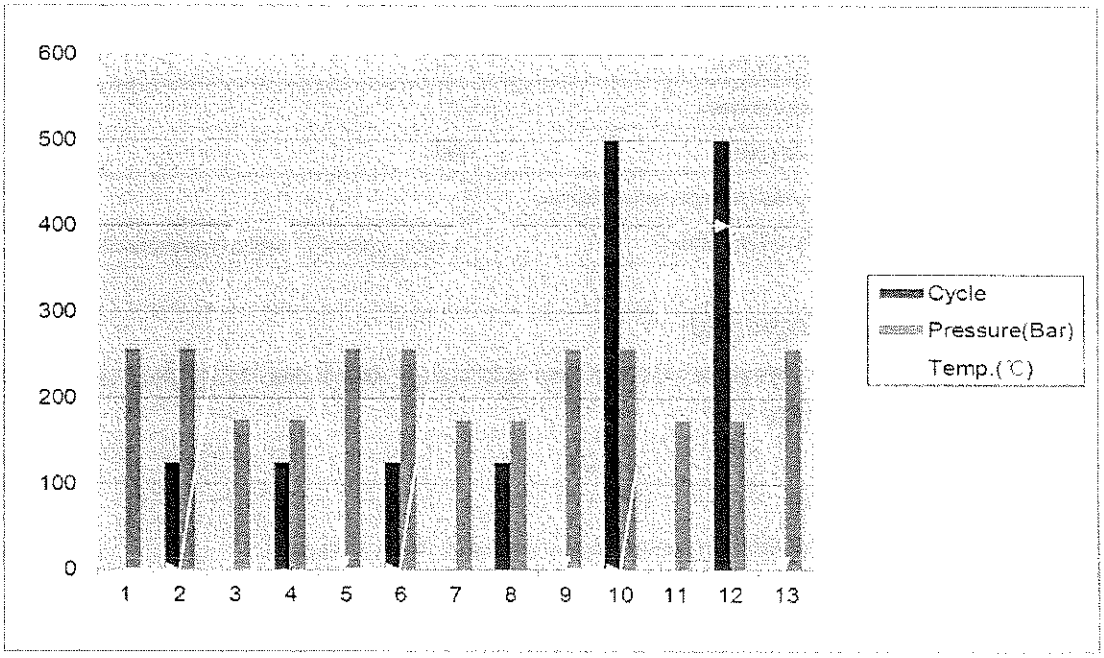
6. TEST STEPS

The below graph specifies fluctuation of the 3 factors over total of 13 test steps.



7. TEST TABLE

The following table describes total of 13 steps and leakage rates in order.

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TEST FROM ROOM TEMPERATURE(-29℃ ~+40℃) to +400℃.

Step 1. PRELIMINERY TESTS AT THE ROOM TEMPERATURE

Pres.(BAR)(BAR)	Body Temp.(℃)(℃)	Body-Bonnet Leakage(PPM)	Packing leakage (atm x cm^3 x s^{-1})	**Packing torque Nm**
256	Room. Temp.	0	7.1×10^{-6}	39

Step 2. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	256	Room. Temp.	8.2×10^{-6}

Step 3. STATIC TEST AT THE SELECTED TEST TEMPERATURE 400℃

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
174	400	8.5×10^{-6}

Step 4. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 400℃

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	174	400	8.6×10^{-6}

Step 5. INTERMEIATE STATIC TESTS AT THE ROOM TEMPERATURE

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
256	Room. Temp.	7.2×10^{-6}

Step 6. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	256	Room. Temp.	1.2×10^{-5}

Step 7. STATIC TEST AT THE SELECTED TEST TEMPERATURE 400℃

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
174	400	9.6×10^{-6}

Step 8. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 400℃

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	174	400	9.9×10^{-6}

Step 9. INTERMEIATE STATIC TESTS AT THE ROOM TEMPERATURE

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
256	Room. Temp.	8.2×10^{-6}

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Step 10. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
500	256	Room. Temp.	9.2×10^{-6}

- In this point, One Packing adjustment is taken for re-tightening.

Step 11. STATIC TEST AT THE SELECTED TEST TEMPERATURE 400℃

Pres.(BAR)	Body Temp.(℃)	Packing leakage	**Packing torque Nm**
174	400	1.7×10^{-5}	39

Step 12. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 400℃

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
500	174	400	2.2×10^{-5}

Step 13. FINAL TEST AT THE ROOM TEMPERAURE

Pres.(BAR)	Body Temp.(℃)	Body-Bonnet leakage(ppm)	Packing leakage (atm x cm^3 x s^{-1})
256	Room Temp.	37	1.5×10^{-5}

POST TEST EXAMINATION

No visible damage or wear on stem packing area

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DATE 16/MAR/2011

ACCEPTANCE TIGHTNESS CLASS

	CLASS B
Body & bonnet gasket seal	≤50 ppmv
Stuffing box stem seal	$\leq 10^{-4}(mg x s^{-1} x m^{-1})$ Equivalent to $\leq 5.6x10^{-4}(atm \times cm^3 \times s^{-1})$

Maximum allowable tightness leakages based on actual dimensions of stuffing box packing seals with :

- stuffing box packing seal : stem diameter 16 mm

	CLASS B
Stuffing box stem seal	Stem diameter(0.016m) xπx5.6x 10^{-4} $(atm \times cm^3 \times s^{-1})$ = $2.8 x10^{-5}$ $(atm \times cm^3 \times s^{-1})$

Conclusion : values observed quality valve to :

TIGHTNESS CLASS : BH

With one packing adjusted**≤SSA1>** for re tightening

ENDURANCE CLASS :

CO2 1,500 cycles

TEMPERAUTRE CLASS:

Room temperature to 400℃

Performance class : **ISO FE BH- CO2 – SSA1 – t- (400℃)-CL800- ISO 15848-1**

BUREAU VERITAS
REVIEWED
WITNESSED
DATE 17/MAR/2011

TEST CHECKED BY :	TEST APPROVED BY :
Man Jong , Ko	Yong Pyo, Cho
DATE: MAR 16TH , 2011	DATE: : MAR 16TH , 2011

SWI Valve Co., Ltd.
Head office & Plant 1 : 1029-2 Gwanyang-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea Tel +82 31 421 1831~3 Fax +82 31 421 1831
Plant 2 : 801-2 Gongyeom-ri, Cheungbuk-myeon, Pyeongtaek-si, Gyeonggi-do, Korea Tel +82 31 684 2931~3 Fax +82 31 684 2934 www.swivalve.com

TEST/INSPECTION CERTIFICATE

DATE : 2011. 02. 07

SWI ORDER NO. : SO2010100089

CERTIFICATE NO. : 100089-4

PROJECT NAME / NO: Fugitive Emission Test Sample

CUSTOMER/CLIENT : SWI Valve Co., Ltd.

PO NO.:

TAG NO.	ITEM DESCRIPTION	Class Press -ure	SIZE (inch)	Q'ty	Hydrostatic Test (kg/cm^2)		Air Test (kg/cm^2)	Materials(ASTM)				Dimen -sion Check	Visual Inspe -ction	Functi -onal Test	Result
					Shell	Seat / Backseat	Seat	Body & Bonnet	Seat Ring (Seat)	Stem	Wedge/ Disc (Ball)				
	GLOBE V/V RF	1500#	1"	1	392	289/289	N/A	A105N	HF	A276-410	A217-CA15/HF	GOOD	GOOD	GOOD	ACCEPTED

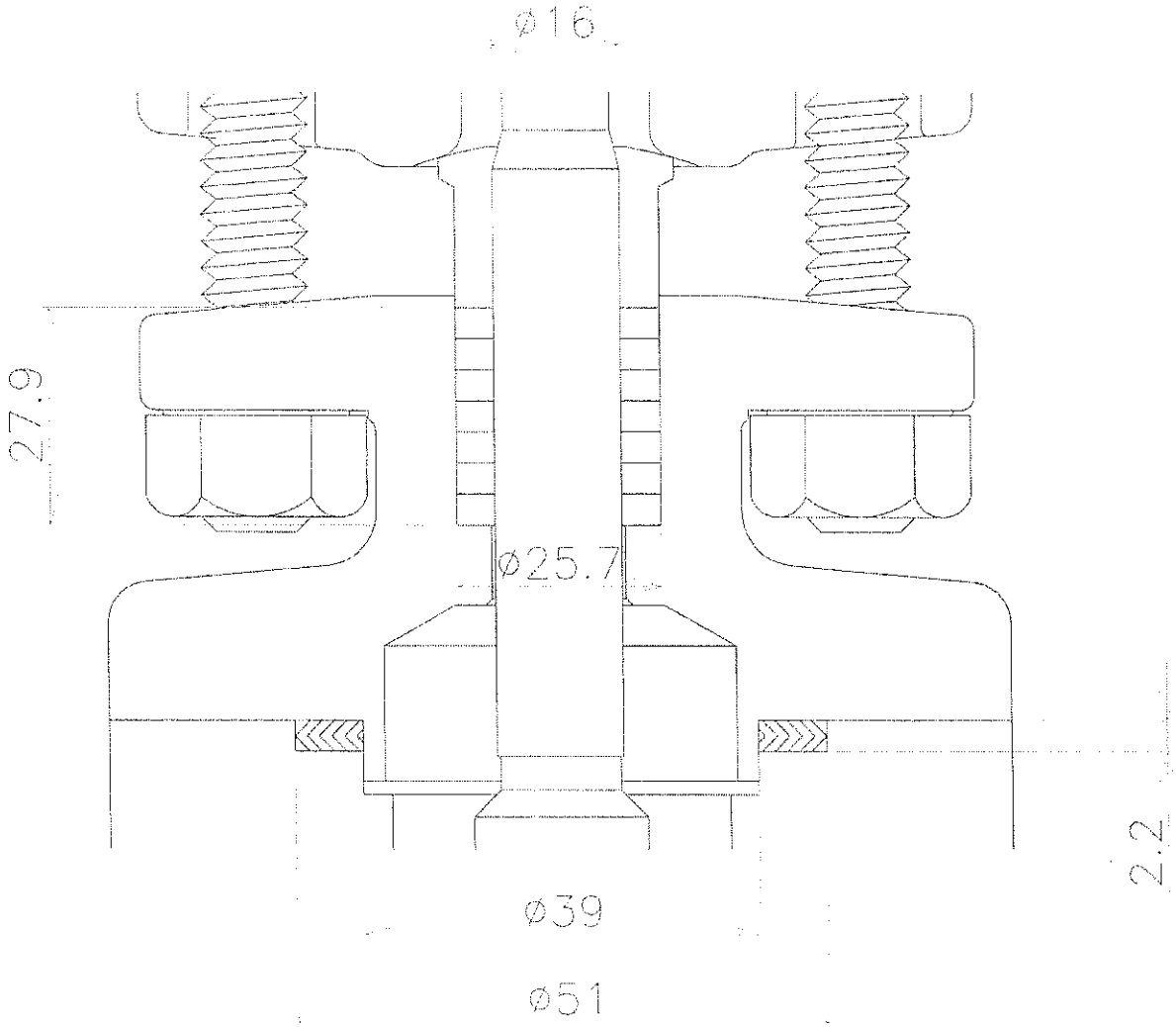
BUREAU VERITAS
REVIEWED
WITNESSED
DATE

Remarks
1. These standard for inspection conform to API 598
2. HF : STELLITE NO. 6 Hard Facing

Witnessed / Reviewed by Customer Rep.

Q.A Manager

WE HEREBY CERTIFY THAT THE RESULTS MENTIONED ABOVE ARE TRUE AND CORRECT IN EVERY DETAIL



GLOBE

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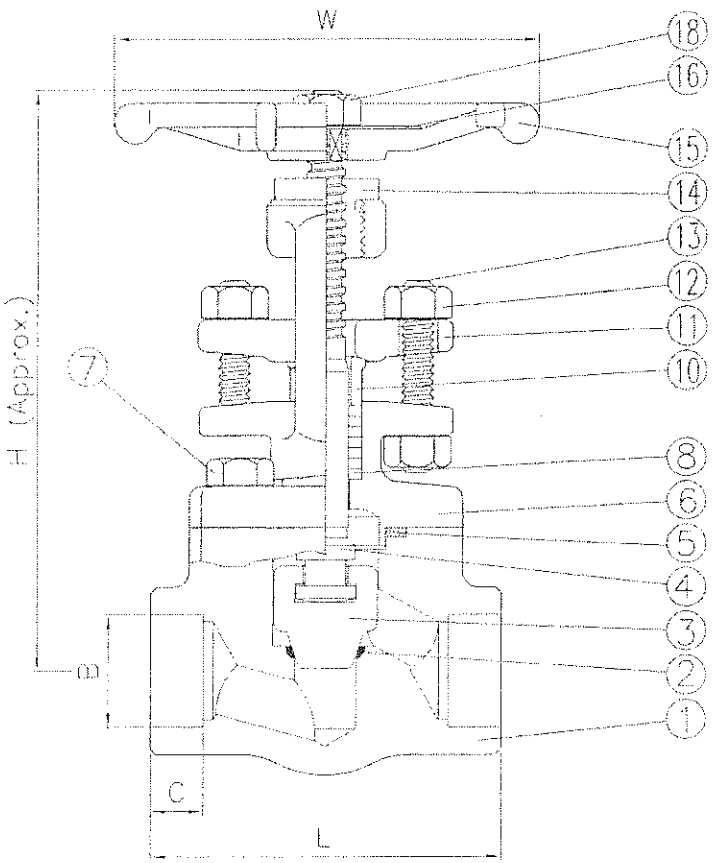


ORDER NO. :

BILL OF MATERIALS

NO.	PARTS	MATERIALS	ASTM
1	Body	Forged Steel	A105
2	Seat	Stellite Hardfacing	
3	Disc	13Cr Stainless Steel	A217-CA15
4	Stem	13Cr Stainless Steel	A276-410
5	Gasket	304 Hoop + Graphite	
6	Bonnet	Forged Steel	A105
7	Bonnet Bolt	Alloy Steel	A193-B7
8	Gland Packing	Graphite + Carbon Fiber	
10	Gland	Stainless Steel	A276-316
11	Gland Flange	Forged Steel	A105
12	Gland Nut	Carbon Steel	A194-2H
13	Gland Bolt	Alloy Steel	A193-B7
14	Yoke Bush	13Cr Stainless Steel	A276-410
15	Handwheel	Malleable Iron	A47
16	Name Plate	Aluminum	
18	Handwheel Nut	Carbon Steel	A194-2H

Hydraulic Test	Shell	: 5575	Psi(392	Kg/cm²)
	Back Seat	: 4100	Psi(289	Kg/cm²)
	Seat	: 4100	Psi(289	Kg/cm²)

Seat of Body	Hardfaced with Stellite #6 on Body
Disc	Stellited (#6)
Valve Finishing	Phosphatized
End Connection	Socket Weld (ASME B16.11)

SIZE (Inch)	H (Open)	L	W	Port Dia.	End Connection B	End Connection C	Weight (Kg)	Q'TY (pcs)	Valve No.
1/4	152	86	102	6.4	14.10	9.7	2.2		
3/8	152	86	102	9.5	17.55	9.7	2.1		
1/2	152	86	102	9.5	21.75	9.7	2.0		
3/4	188	102	114	12.7	27.10	12.7	3.4		
1	219	152	140	17.5	33.80	12.7	6.5		
1-1/4	260	172	165	22.5	42.55	12.7	9.7		
1-1/2	260	172	165	29.5	48.65	12.7	9.6		
2	324	210	184	35.0	61.15	15.8	14.0		

BUREAU VERITAS
REVIEWED
WITNESSED
DATE

Rev. No.	Description	REV'D	APP'D
3			
2			
1			

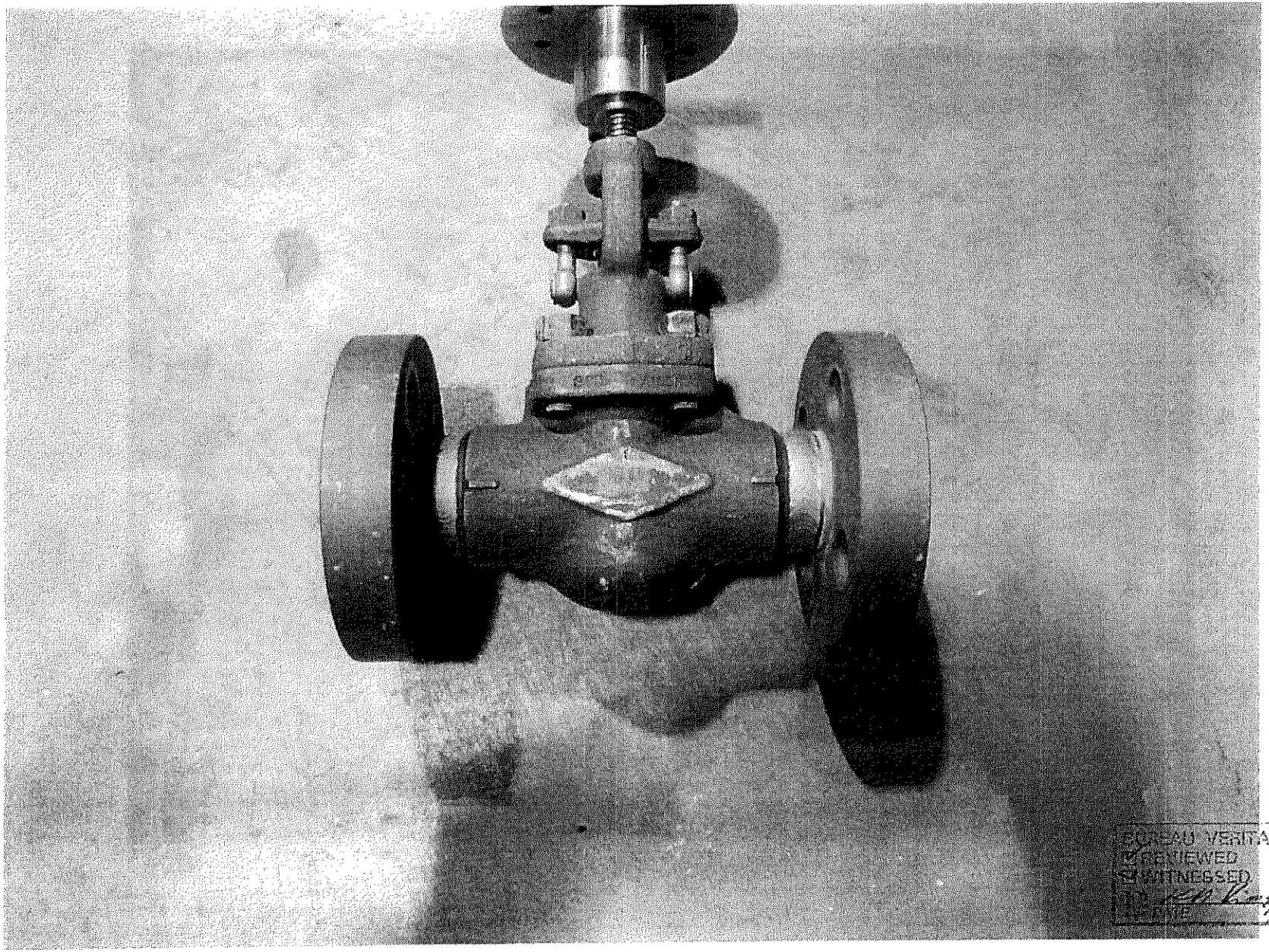
TITLE FORGED STEEL GLOBE VALVE CLASS 1500
BB OS & Y S.W REDUCED PORT

Refer to: API 602 Fig No.: D.W.G. No. 1103(961-02)

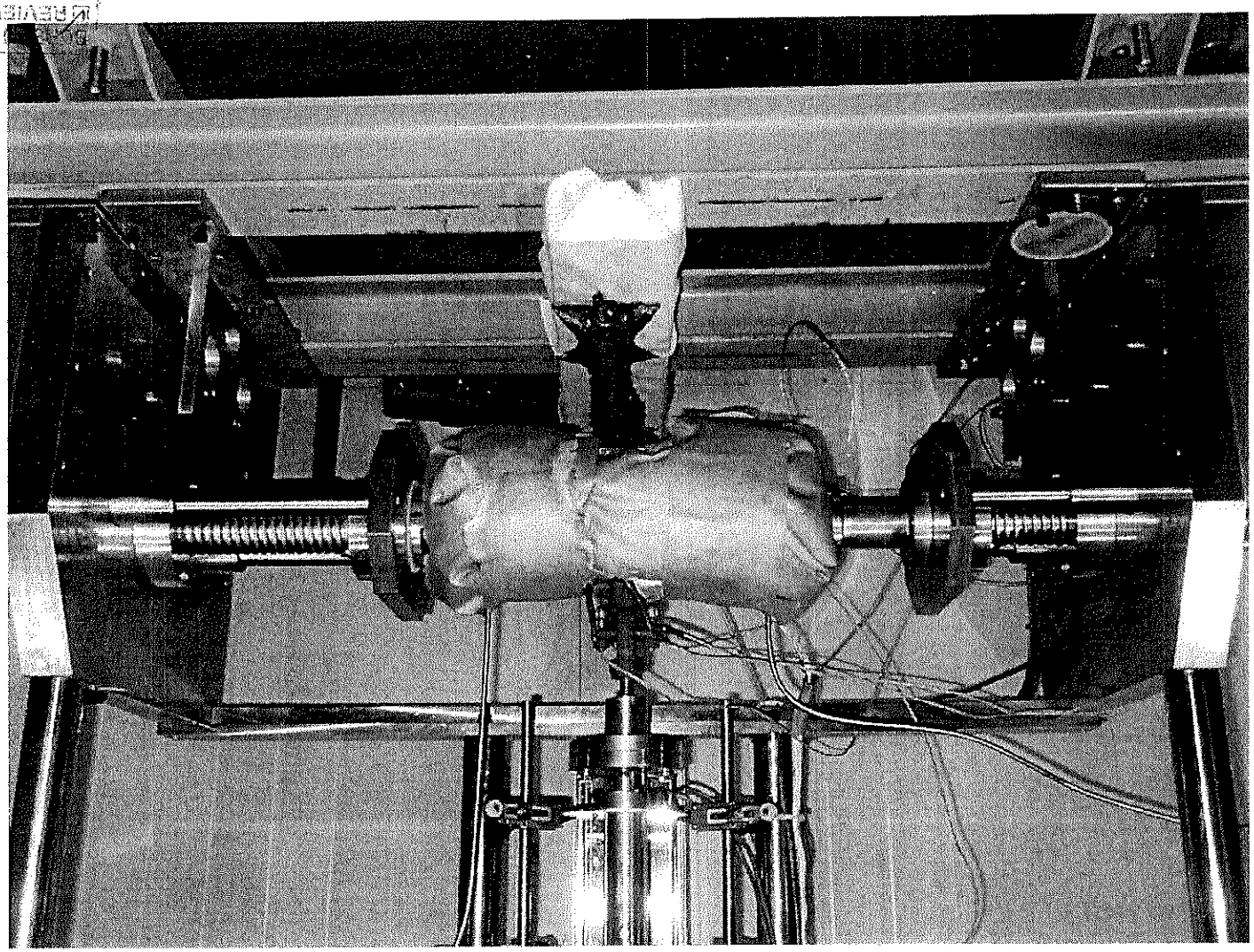
Drawn by: J.B.CHOI Chk'd by K.H.JUNG App'd by K.H.JUNG

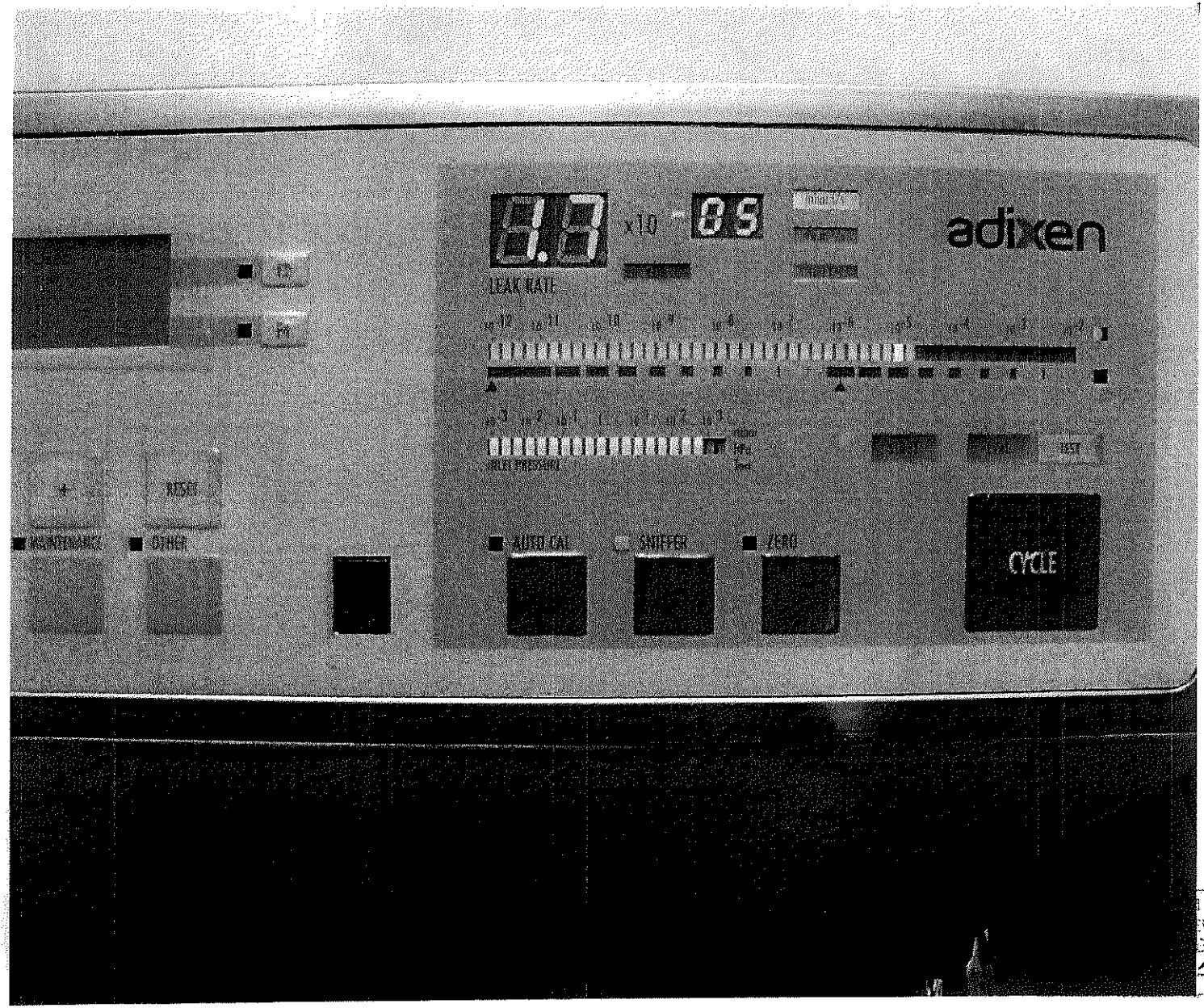
CLIENT :

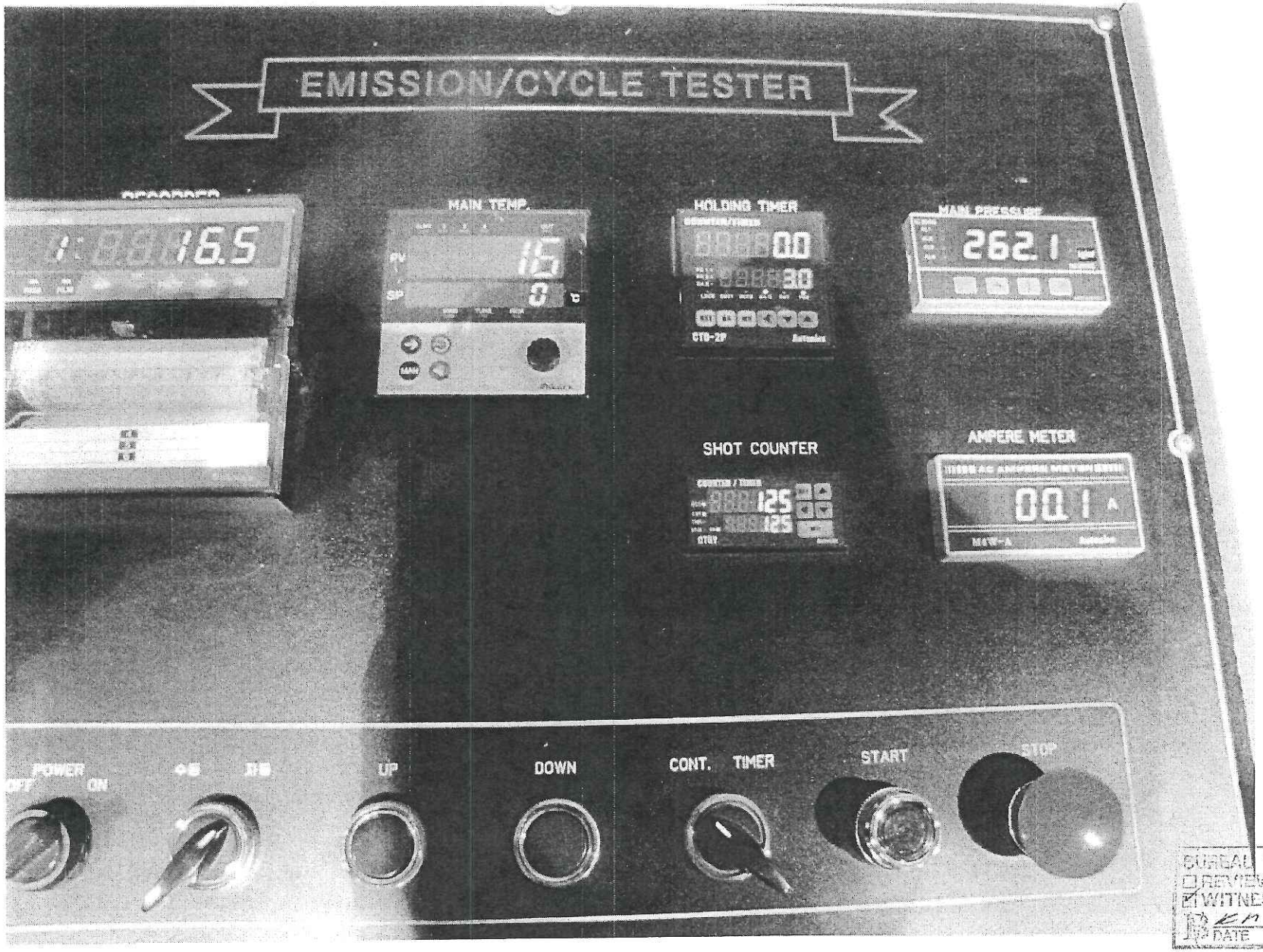
S W I Valve Co., Ltd.

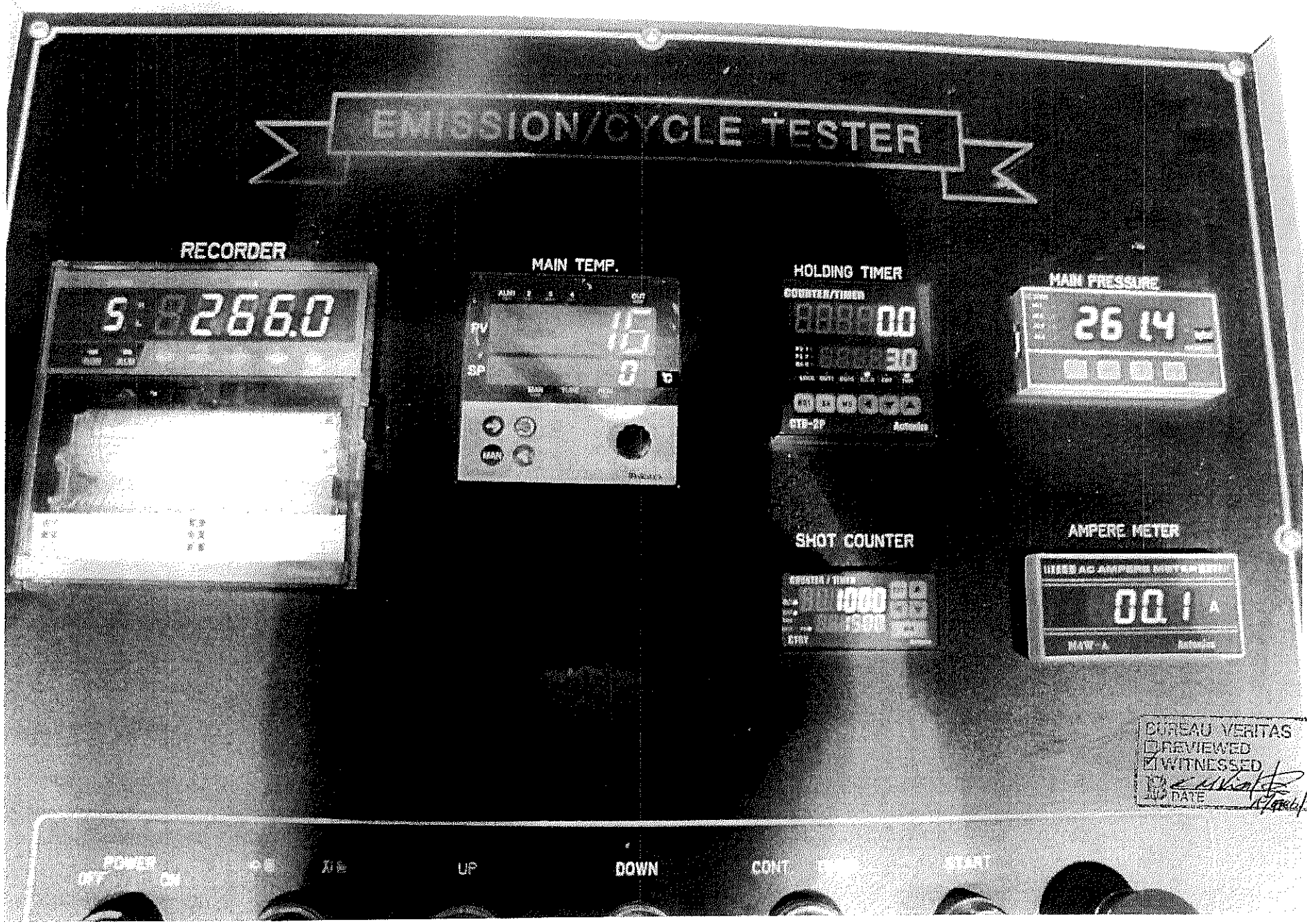


BUREAU VERITAS
REVIEWED
WITNESSED
DATE 21/12/2011








EMISSION/CYCLE TESTER
RECORDER
MAIN TEMP.
HOLDING TIMER
MAIN PRESSURE
SHOT COUNTER
AMPERE METER
BUREAU VERITAS
REVIEWED
WITNESSED
DATE
POWER
OFF
ON
UP
DOWN
CONT

Energy & Process

TYPE APPROVAL CERTIFICATE FOR BALL VALVE
No. 940013/3-TC-05

B.V. Job Ref :3.30.1030.03

Inspection ordered to B.V. by (1) : SWI Valve Co. Ltd.

#1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Manufacturer : SWI Valve Co. Ltd., Korea

(1) the addressee of the original of this certificate :

Description of the Supply / Subject of inspection :

Product : Forged Steel Ball Valve

Size of Tested Valve : 1"
Material of Tested Valve : ASTM A105N
Class of Tested Valve : #2500
Stem Diameter : 16.0 mm
Tightness class : below 100ppm
Endurance class : 1500cycles
Temperature range : Room temperature to +200°C
Packing Adjustment number : 0

This certificate covers the whole of the supply: ☒ YES (no more inspection planned) ☐ NO (part of the supply still to be inspected)

Scope of the B.V. Survey :

- Witness for Type Test of Fugitive Emission Test

This supply complies with the following applicable document (s) : (2)

- API 622 Type Testing of Process Valve Packing for Fugitive Emissions

(2) and only for parts of the document(s) which concern the certification or the relevant service provided by Bureau Veritas.

List of enclosures: Test Report for Fugitive Emission Test ---------- 3 Pages

(or reference to enclosed list)
The certificate is valid together with enclosures (if listed). Only pages of enclosures (or parts of pages) which are stamped, are considered as part of this certificate.

Marking and Stamping on the items: NONE

Particulars or comments:

This is to certify that the following valves have been inspected by Bureau Veritas and found to be satisfactory in The Fugitive Emission Test in accordance with API 622 First Edition, August 2006.

Date of Issuance : 24-Mar-2011 Issued by :
Date of last inspection : 21 to 23-Feb-2011 Name : K. M. Kim

Sign :

Location of inspection : BV-Korea, Seoul Office

BUREAU VERITAS KOREA

This certificate is delivererad within the Scope of the General Conditions of Services of Bureau Veritas
Ce Certificat est délivré dans le cadre des Conditions Générales de Service du Bureau Veritas

This certificate is issued further to an inspection whose duration and scope were limited by the terms and conditions of the contract with BV principal. This certificate is NOT an indication that the item(s) is (are) fit for any specific purpose and does not release the manufacturer, supplier and any party from their respective duty, guarantee, obligation and/or indemnity relating to, without limitation, patents, workmanship, materials, safety, performance in operation and/or reliability.	

Ad ME 9613b

PROTOTYPE TEST FOR VALVE
ACCORDING TO API 622 FIRST EDITION , AUGUST 2006.

- Fugitive Emission Test equipment specification

1. Manufacturer : SWI VALVE CO. LTD.
2. Address : 1023-2 Gwanyang 1-dong,Dongan-gu,
   Anyang-si, Gyeonggi-do, Korea
3. Date of Test : 21th Feb,2011 to 23th Feb,2011

1. VALVE SPECIFICATION

Valve size & type	3-P BALL 2500# A105N/316+PEEK 1""
Material of Valve	A105N
Valve class	2500#
Stem diameter	16.0 mm
Gland packing type	Graphite Molded Packing
Packing material	FKM+Graphite
Operating torque	139.6 N/m
Stroke/ Angle	Quarter-turn

2.TEST CONDITION

Test pressure	365-426 bar
Test medium	He 99%
Check medium	He 99%
Test temperature	RT/ 200℃
Test equipment	Fugitive emission test equip. manufactured by SWI VALVE CO. LTD.
Leakage measurement equipment	Helium Detector(ALCATEL Model ASM142 series)
Sampling method	Random
Valve repacking before test	0
Insulation of test valve	Heating Jacket used
Actuator	Geared motor

BUREAU VERITAS
REVIEWED
WITNESSED
DATE 23/Feb/2011

A.1- Fugitive Emissions Test Report Summary

API Std 622

Fugitive Emissions Testing Report Number: SWI-FET-12

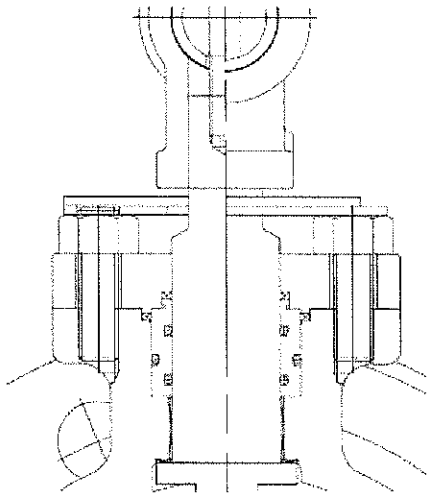
Application Profile : Check One ☑ Rotating ☐ Rising	Manufacturer: SWI VALVE CO. LTD. Description: 3-P Ball A105N 2500# 1" RF
Testing Facility: SWI Factory Technician: ManJong,Ko Witness: Ki-Man , Kim Start date: 21TH Feb,2011 Completion: 23TH Feb,2011	Source: ☑ Manufacturer Date: 16TH Feb,2011 ☐ Distributor Packaged: Indicate New or ☐ New Current Product ☑ Current
Gland Load Information psi. Gland Nut Torque : 39 ft-lbs	
Notes concerning installation instructions	

Testing Profile Details

Test Segment	Leak measurement (500 ppm)	Temperature(℃)	Reference Temperature(℃) at packing gland	Flats Adjusted-Gland Nut Torque ft-lbs	Reference A Height (mm)	
Day1 Start,Ambient 0-250 cycles P=426 (bar)	152	Room temp.	Room temp.	39	44.50	
	124	Room temp.	Room temp.			
	134	Room temp.	Room temp.			
	164	Room temp.	Room temp.			
	154	Room temp.	Room temp.			
	167	Room temp.	Room temp.			
High Temperature 250-500cycles P=365(bar)	202	200℃	176℃			
	206	200℃	176℃			
	211	200℃	176℃			
	234	200℃	176℃			
	227	200℃	176℃			
Day2 Start,Ambient 500-750 cycles P=426(bar)	168	Room temp.	Room temp.			
	194	Room temp.	Room temp.			
	135	Room temp.	Room temp.			
	174	Room temp.	Room temp.			
	164	Room temp.	Room temp.			
	184	Room temp.	Room temp.			
High Temperature 750-1000 cycles P=365(bar)	233	200℃	176℃			
	206	200℃	176℃			
	211	200℃	176℃			
	234	200℃	176℃			
	227	200℃	176℃			
Day3 Start,Ambient 1000-1250 cycles P=426(bar)	185	Room temp.	Room temp.			
	164	Room temp.	Room temp.			
	171	Room temp.	Room temp.			
	169	Room temp.	Room temp.			
	170	Room temp.	Room temp.			
	180	Room temp.	Room temp.			
High Temperature 1250-1500cycles P=365(bar)	190	200℃	176℃			
	193	200℃	176℃			
	199	200℃	176℃			
	200	200℃	176℃			
	205	200℃	176℃			

A grqph depicting the test profile with associated leak checks and reajustments shall be provide by the testing authority.

BUREAU VERITAS
☐ REVIEWED
☑ WITNESSED
DATE 5/Feb/2011

API Std 622 Emissions Testing Report Summary	
Test Number: SWI-FET-10	Test Date: 21TH to 23TH Feb,2011
Packing Material: FKM+ Graphite	Style Number:
Packing Manufacturer: PPE	Source of Sample: 3P BALL A105N/316+PEEK SW BC 2500# 1"
Test Packing Cross-section: (circular) o-ring / Rectangle	Laboratory Name: SWI LABORATORY Location of Test: SWI FACTORY
Packing Gland OD and ID(at the packing): OD= 29 ID= 23	Packing Gland Bolt Diameter= 12.7mm
Number of Mechanical Cycles: 750	Packing Compression % of Free Height= 100 % Torque on Gland Nuts(each side)= 39/ 39 (ft-lbs)
Number of Thermal Cycles: 750 Maximum Test Pressure : 426 bar	Mechanical Cycles Prior to Readjustment: Non-applicable Number of Readjustments: 0
Packing Configuration: FKM + GRAPHITE Number of rings tested: 3 Oring + 2 GRAPHITE Circle the following Ring shape(square, circular, vee) Solid or split Braided Die formed Spool stock Wire or other reinforcement Corrosion inhibitor &type Other	Show Sketch of Packing Installation-define each ring: 

TEST CHECKED BY :	TEST APPROVED BY :
Man Jong , Ko	Yong Pyo, Cho
DATE: MAR 16TH , 2011	DATE: : MAR 16TH , 2011

BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE 29/Mar/2011

BUREAU VERITAS

Energy & Process

TYPE APPROVAL CERTIFICATE FOR BALL VALVE
No. 940013/3-TC-06

B.V. Job Ref :3.30.1030.03

Inspection ordered to B.V. by (1) : SWI Valve Co. Ltd.

#1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Manufacturer : SWI Valve Co. Ltd., Korea

(1) the addressee of the original of this certificate ;

Description of the Supply / Subject of inspection :

Product : Forged Steel Ball Valve

Size of Tested Valve : 1"
Material of Tested Valve : ASTM A105N
Class of Tested Valve : #2500
Stem Diameter : 16.0 mm
Tightness class AH
Endurance class : CO2(1500cycles)
Temperature class : t200°C
Valves Qualified according to sizes : up to 2" (Stem Dia. : 8.0 to 32.0 mm)
Valves Qualified according to pressure ratings : #150, #300, #600 , #800, #1500, #2500
Valves Qualified according to tightness class : AH
Valves Qualified according to Endurance class : CO2(1500cycles)
Valves Qualified according to temperature class : Room temperature to +200°C

This certificate covers the whole of the supply: ☒ YES (no more inspection planned) ☐ NO (part of the supply still to be inspected)

Scope of the B.V. Survey :

- Witness for Type Test of Fugitive Emission Test

This supply complies with the following applicable document (s) : (2)

- ISO 15848-1 Industrial Valves-Measurement, Test and Qualification Procedure for Fugitive Emission

(2) and only for parts of the document(s) which concern the certification or the relevant service provided by Bureau Veritas.

List of enclosures: Test Report for Fugitive Emission Test ---------- 6 Pages

(or reference to enclosed list)

The certificate is valid together with enclosures (if listed). Only pages of enclosures (or parts of pages) which are stamped, are considered as part of this certificate

Marking and Stamping on the items: NONE

Particulars or comments:

This is to certify that the following valves have been inspected by Bureau Veritas and found to be satisfactory in The Fugitive Emission Test in accordance with ISO 15848-1 Edition2006.

Date of Issuance : 24-Mar-2011 Issued by :

Date of last inspection : 21 to 22-Feb-2009 Name : K. M. Kim

Sign :

Location of inspection : BV-Korea, Seoul Office

BUREAU VERITAS KOREA

This certificate is deliverered within the Scope of the General Conditions of Services of Bureau Veritas
Ce Certificat est délivré dans le cadre des Conditions Générales de Service du Bureau Veritas

This certificate is issued further to an inspection whose duration and scope were limited by the terms and conditions of the contract with BV principal. This certificate is NOT an indication that the item(s) is (are) fit for any specific purpose and does not release the manufacturer, supplier and any party from their respective duty, guarantee, obligation and/or indemnity relating to, without limitation, patents, workmanship, materials, safety, performance in operation and/or reliability.

Ad ME 9613b

PROTOTYPE TEST FOR VALVE
ACCORDING TO ISO 15848-1 Edition 2006

- Fugitive Emission Test equipment specification

1. Manufacturer : SWI VALVE CO. LTD.
2. Address : 1023-2 Gwanyang 1-dong,Dongan-gu,
   Anyang-si, Gyeonggi-do, Korea
3. Date of Test : 21th Feb,2011 to 22th Feb,2011

1. VALVE SPECIFICATION

Valve size & type	3-P BALL 2500# A105N/316+PEEK 1"
Material of Valve	A105N
Valve class	2500#
Stem diameter	16.0 mm
Gland packing type	Graphite Molded Packing
Packing material	FKM+Graphite
Operating torque	139.6 N/m
Stroke/ Angle	Quarter-turn

2. TEST CONDITION

Test pressure	365-426 bar
Test medium	He 99%
Check medium	He 99%
Test temperature	RT/ 200℃
Test equipment	Fugitive emission test equip. manufactured by SWI VALVE CO. LTD.
Leakage measurement equipment	Helium Detector(ALCATEL Model ASM142 series)
Sampling method	Random
Valve repacking before test	0
Insulation of test valve	Heating Jacket used
Actuator	Geared motor

BUREAU VERITAS
REVIEWED
WITNESSED
DATE

3. CONDITION FOR CYCLING TEST

Number of step test cycles	4
Number of cycles for step	125
Number of step test cycles	2
Number of cycles for step	500
Number of step cycles at high temperature	3
The duration of the cycle stroke	14sec. (open 4sec. +stem movement 4sec.+close 4sec.)

4. DOCUMENTATION USED

Industrial Valves- Measurement test and qualification procedures for fugitive emission Spec. ISO 15848-1 Edition 2006.

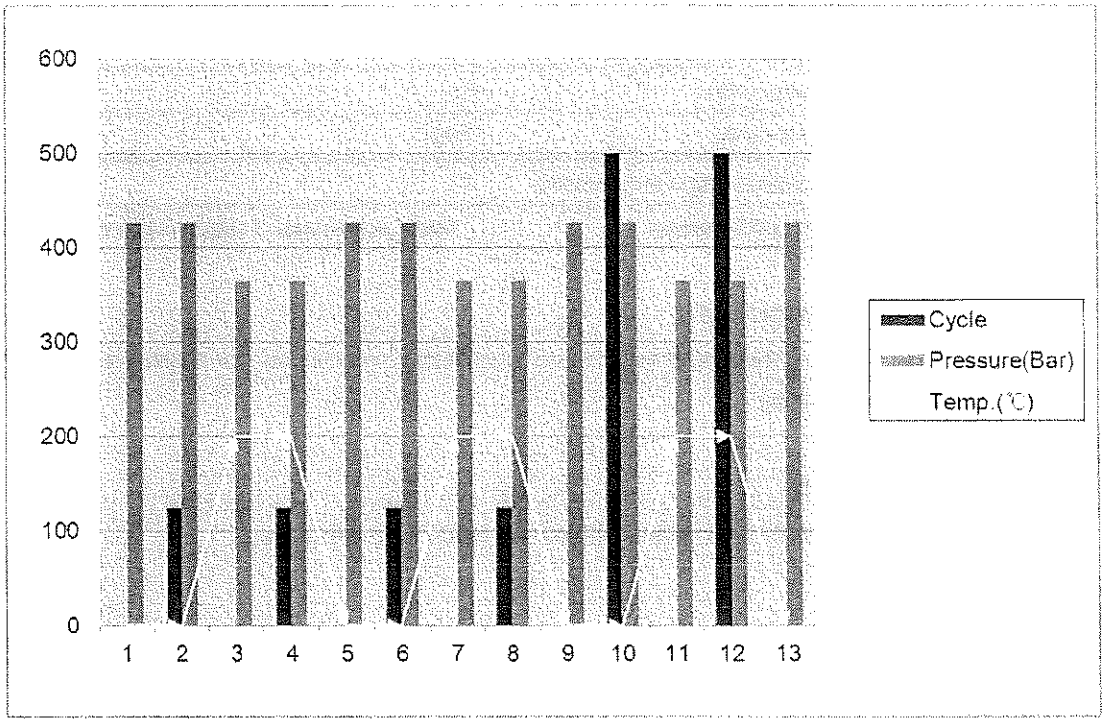
5. TEST RESULTS

Test results are recorded in manufactures test report from next page.

BUREAU VERITAS
☐ REVIEWED
☑ WITNESSED
DATE 21/Feb./2011

6. TEST STEPS

The below graph specifies fluctuation of the 3 factors over total of 13 test steps.



7. TEST TABLE

The following table describes total of 13 steps and leakage rates in order.

BUREAU VERITAS
☐REVIEWED
☑WITNESSED
DATE

TEST FROM ROOM TEMPERATURE TO +200℃

Step 1. PRELIMINERY TESTS AT THE ROOM TEMPERATURE

Pres. (BAR)	Body Temp.(℃)	Body-Bonnet Leakage(PPM)	Packing leakage (atm x cm^3 x s^{-1})
426	Room. Temp.	0	1.0×10^{-7}

Step 2. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	426	Room. Temp.	1.3×10^{-7}

Step 3. STATIC TEST AT THE SELECTED TEST TEMPERATURE 200℃

Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
365	200	1.2×10^{-7}

Step 4. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 200℃

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	365	200	1.8×10^{-7}

Step 5. INTERMEIATE STATIC TESTS AT THE ROOM TEMPERATURE

Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
426	Room. Temp.	1.7×10^{-7}

Step 6. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	426	Room. Temp.	1.6×10^{-7}

Step 7. STATIC TEST AT THE SELECTED TEST TEMPERATURE 200℃

Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
365	200	1.9×10^{-7}

Step 8. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 200℃

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	365	200	2.3×10^{-7}

Step 9. INTERMEIATE STATIC TESTS AT THE ROOM TEMPERATURE

Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
426	Room. Temp.	2.1×10^{-7}

BUREAU VERITAS
REVIEWED
WITNESSED
DATE

Step 10. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage ((atm x cm^3 x s^{-1})
500	426	Room. Temp.	2.0×10^{-7}

Step 11. STATIC TEST AT THE SELECTED TEST TEMPERATURE 200℃

Pres. (BAR)	Body Temp.(℃)	Packing leakage(atm x cm^3 x s^{-1})
365	200	2.6×10^{-7}

Step 12. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 200℃

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
500	365	200	2.5×10^{-7}

Step 13. FINAL TEST AT THE ROOM TEMPERAURE

Pres. (BAR)	Body Temp.(℃)	Body-Bonnet leakage(PPM)	Packing leakage (atm x cm^3 x s^{-1})
426	Room Temp.	15	1.9×10^{-7}

POST TEST EXAMINATION

No visible damage and wear on stem packing area

BUREAU VERITAS
REVIEWED
WITNESSED
DATE

ACCEPTANCE TIGHTNESS CLASS

	CLASS A
Body & bonnet gasket seal	≤50 ppmv
Stuffing box stem seal	$\leq 10^{-6}(mg x s^{-1} x m^{-1})$ Equivalent to $\leq 5.6x10^{-6}(atm \times cm^3 \times s^{-1})$

Maximum allowable tightness leakages based on actual dimensions of stuffing box packing seals with :

- stuffing box packing seal : stem diameter 16.0 mm

	CLASS A
Stuffing box stem seal	Stem diameter(0.016m)x5.6x 10^{-6} $(atm \times cm^3 \times s^{-1})$ = $2.8 x10^{-7}$ $(atm \times cm^3 \times s^{-1})$

Conclusion : values observed quality valve to :

TIGHTNESS CLASS : AH

With no packing adjusted**≤SSA0>** for re tightening

ENDURANCE CLASS :

CO2 1,500 cycles

TEMPERAUTRE CLASS:

Room temperature to 200℃

Performance class : **ISO FE AH- CO2 – SSA0 – t- (200℃)-CL600- ISO 15848-1**

BUREAU VERITAS
REVIEWED
WITNESSED
DATE Feb. 17th 11

TEST CHECKED BY :	TEST APPROVED BY :
Man Jong , Ko	Yong Pyo, Cho
DATE: MAR 16TH , 2011	DATE: : MAR 16TH , 2011

SWI Valve Co., Ltd.
Head office & Plant 1 : 1023-2 Gwanyang-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea Tel +82.31.421.1831~3 Fax +82.31.421.1834
Plant 2 : 801-2 Garyeom-ri, Oseong-hyeon-myeon, Pyeongtaek-si, Gyeonggi-do, Korea Tel +82.31.684.2981~3 Fax +82.31.684.2984 www.swivalve.com

TEST/INSPECTION CERTIFICATE

DATE : 2011. 02. 16

SWI ORDER NO. : SO2010100089

CERTIFICATE NO. : 100089-2

PROJECT NAME / NO: Fugitive Emission Test Sample

CUSTOMER/CLIENT : SWI Valve Co., Ltd.

PO NO.:

TAG NO.	ITEM DESCRIPTION	Class Press -ure	SIZE (inch)	Q'ty	Hydrostatic Test (kg/cm^2)		Air Test (kg/cm^2)	Materials(ASTM)				Dimen -sion Check	Visual Inspe -ction	Functi -onal Test	Result
					Shell	Seat / Backseat	Seat	Body & Bonnet	Seat Ring (Seat)	Stem	Wedge/ Disc (Ball)				
	BALL V/V RF	2500#	1"	1	657	N.A	7	A105N	PEEK	A276-316	A276-316	GOOD	GOOD	GOOD	ACCEPTED

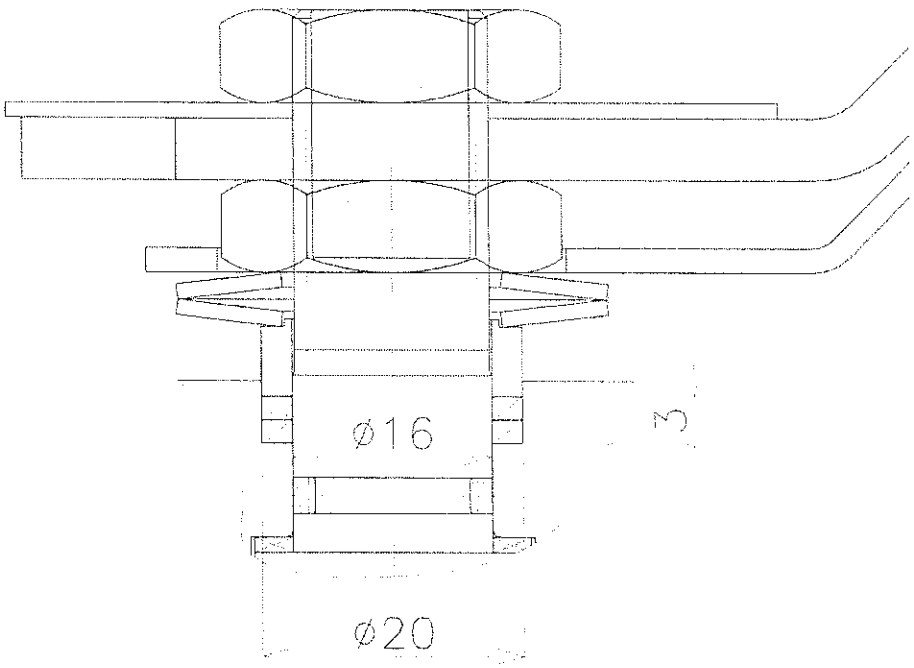
Remarks
1. These standard for inspection conform to API 598
2. HF : STELLITE NO. 6 Hard Facing

BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE 24 Feb 2011

Witnessed / Reviewed by Customer Rep.

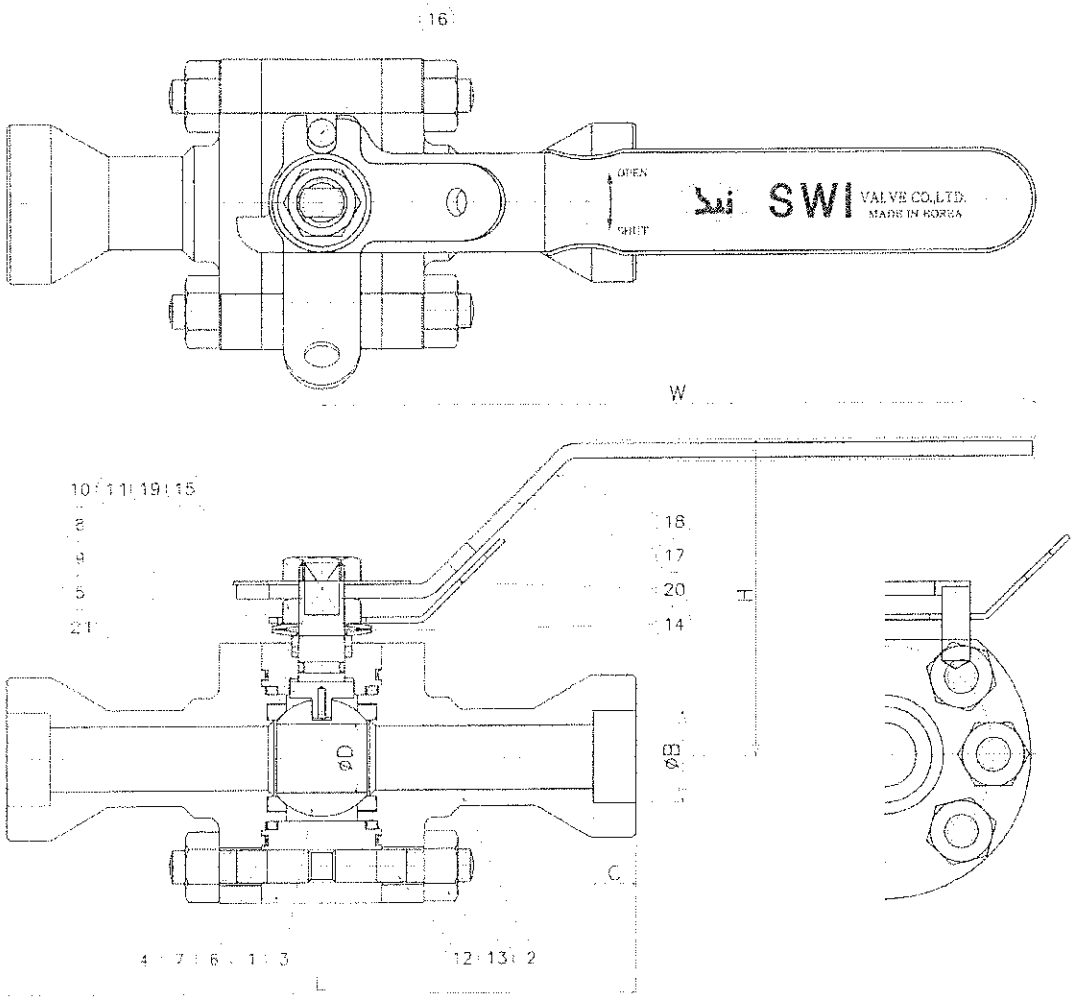
Q.A Manager

WE HEREBY CERTIFY THAT THE RESULTS MENTIONED ABOVE ARE TRUE AND CORRECT IN EVERY DETAIL



BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE 25/Feb/2011

BALL



ORDER NO. :

BILL OF MATERIALS

NO.	PARTS	MATERIALS	ASTM
1	Body	Forged Steel	A105
2	Connector	Forged Steel	A105
3	Ball	Stainless Steel	A276-316
4	Seat Ring	PEEK	
5	Stem	Stainless Steel	A276-316
6	Connector Gasket	Graphite	
7	Connector Seal	Viton	
8	Stem Seal	Viton	
9	Thrust Seal	PEEK	
10	Gland Packing	Graphite	
11	Gland	Stainless Steel	A276-316
12	Connector Bolt	Stainless Steel	A193-B8
13	Connector Nut	Stainless Steel	A194-8
14	Disc Spring	Stainless Steel	316SS
15	Stem Nut	Stainless Steel	A276-316
16	Stop Pin	Stainless Steel	A276-316
17	Lever	C.S / Galvanized	A283D
18	Lever Sleeve	Vinyl Plastic	
19	Name Plate	Stainless Plate	A240-316
20	Locking Device	Stainless Plate	A240-316
21	Anti-Static Device	Stainless Steel	316SS
22	Stop Plate	Stainless Plate	A240-316

Hydraulic Test Shell : 9275 Psi(653 Kg/Cm²)

Pneumatic Test Seat : 100 Psi(7 Kg/Cm²)

Valve Finishing Phosphatized

End Connection Socket Weld (ASME B16.11)

Rev. No.	Description	REV'D	APP'D
3			
2			
1			

TITLE FORGED STEEL 3-P BALL VALVE
CLASS 2500 S.W REDUCED PORT

SIZE (Inch)	H	L	A	øD	End Connection B	End Connection C	Weight (Kg)	Q'TY (pcs)
1/2	110	210	230	19.0	21.75	9.7		
3/4	110	210	230	19.0	27.10	12.7		
1	110	210	230	19.0	33.80	12.7		
1-1/2	135	248	280	25.0	48.65	12.7		

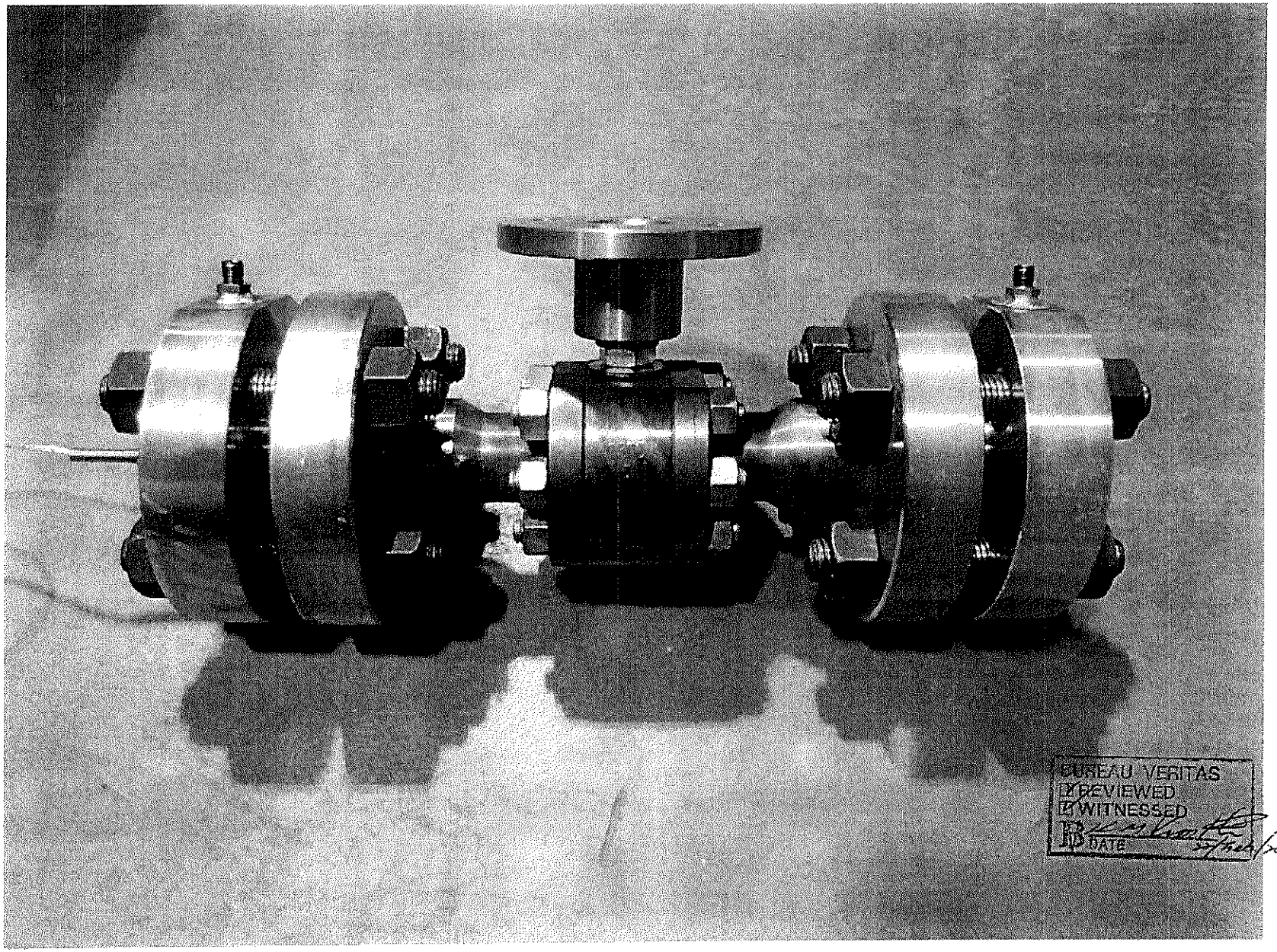
Valve No.
BUREAU VERITAS
REVIEWED
WITNESSED
DATE

Refer to ASME B16.34 Fig No. D.W.G. No 11031961-03

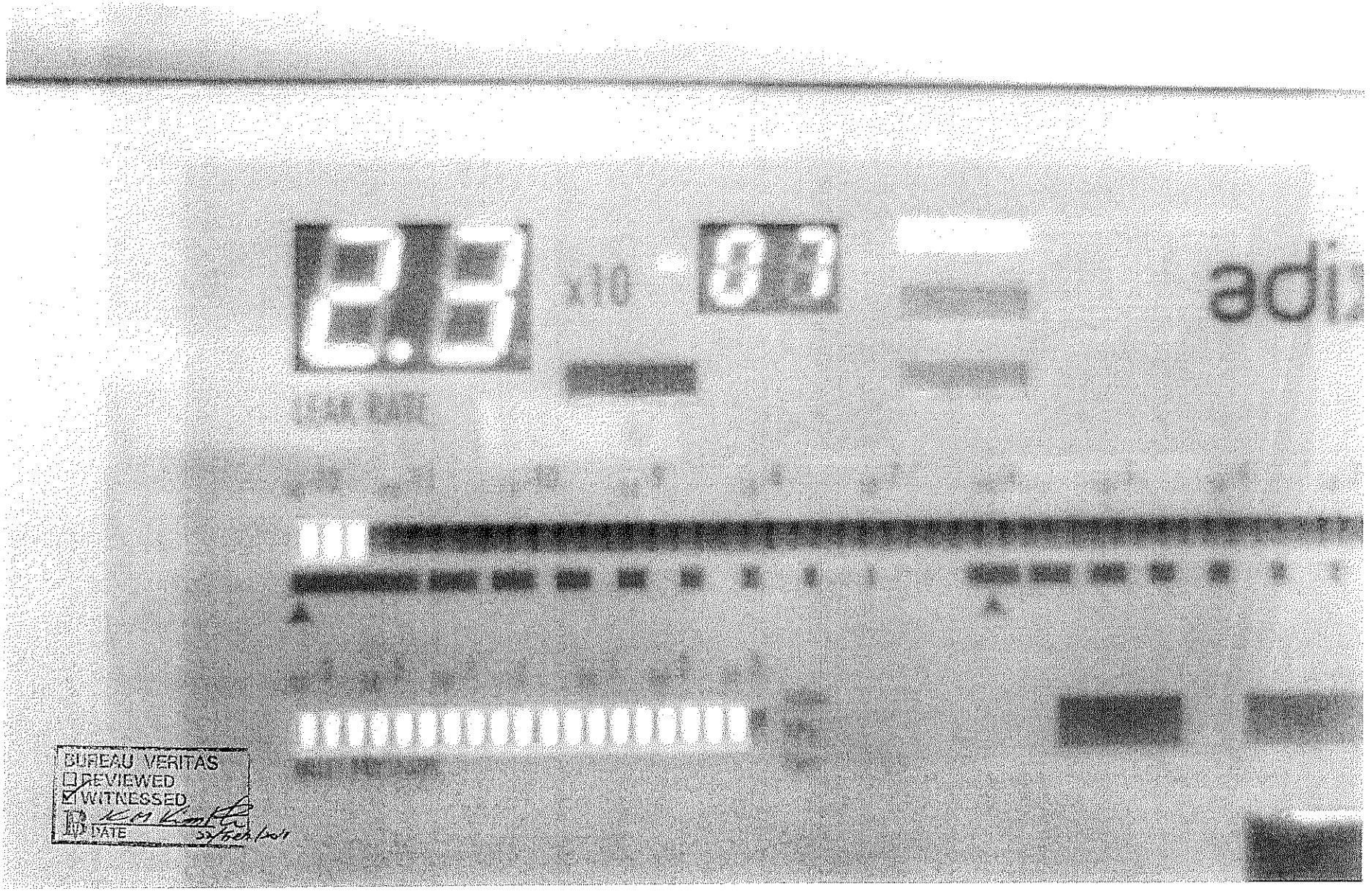
Drawn by J.B.CHOI Chk'd by K.H.JUNG App'd by K.H.JUNG

CLIENT :

S W I Valve Co., Ltd.


BUREAU VERITAS
REVIEWED
WITNESSED
DATE

BUREAU VERITAS
REVIEWED


BUREAU VERITAS
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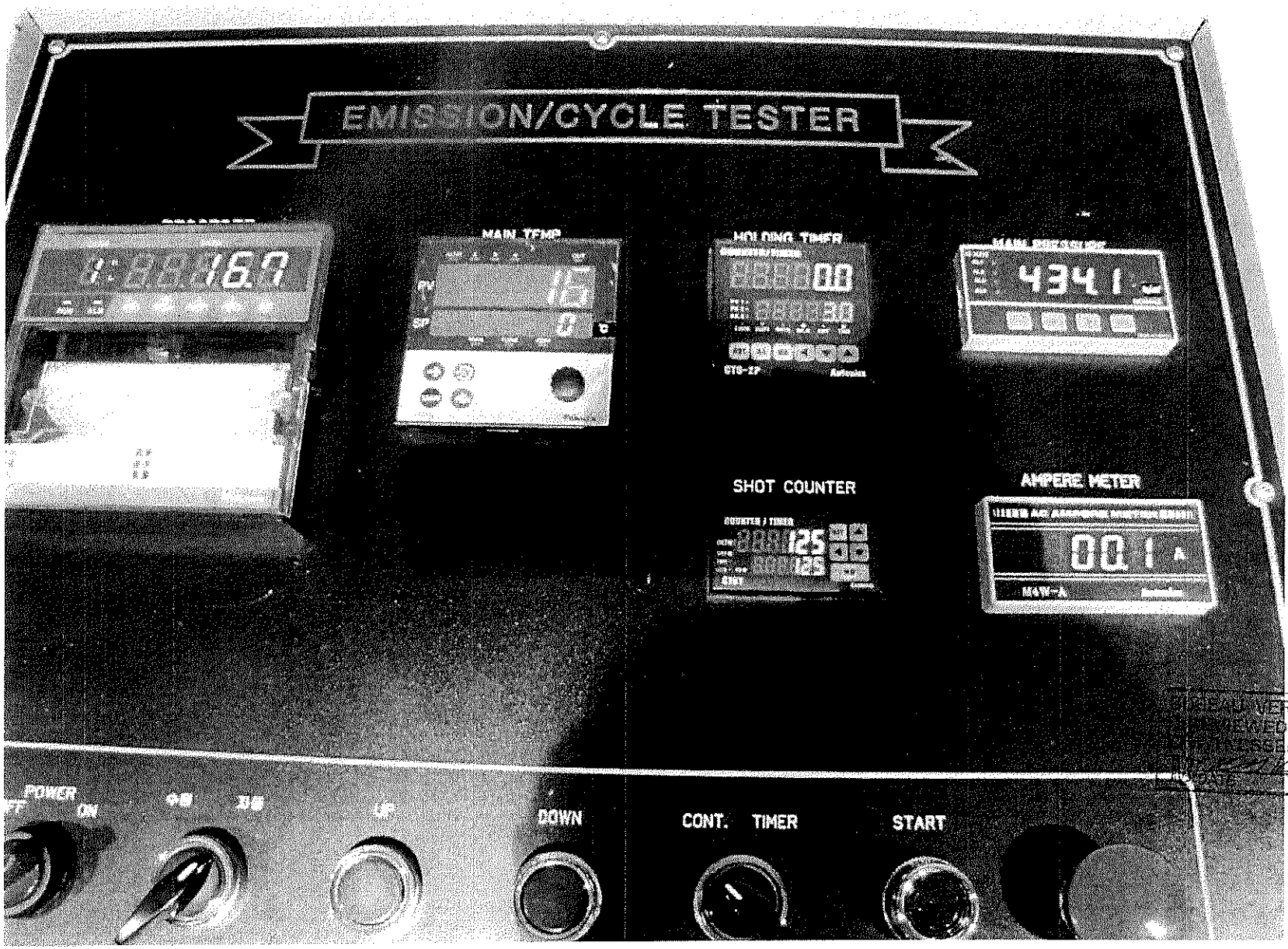
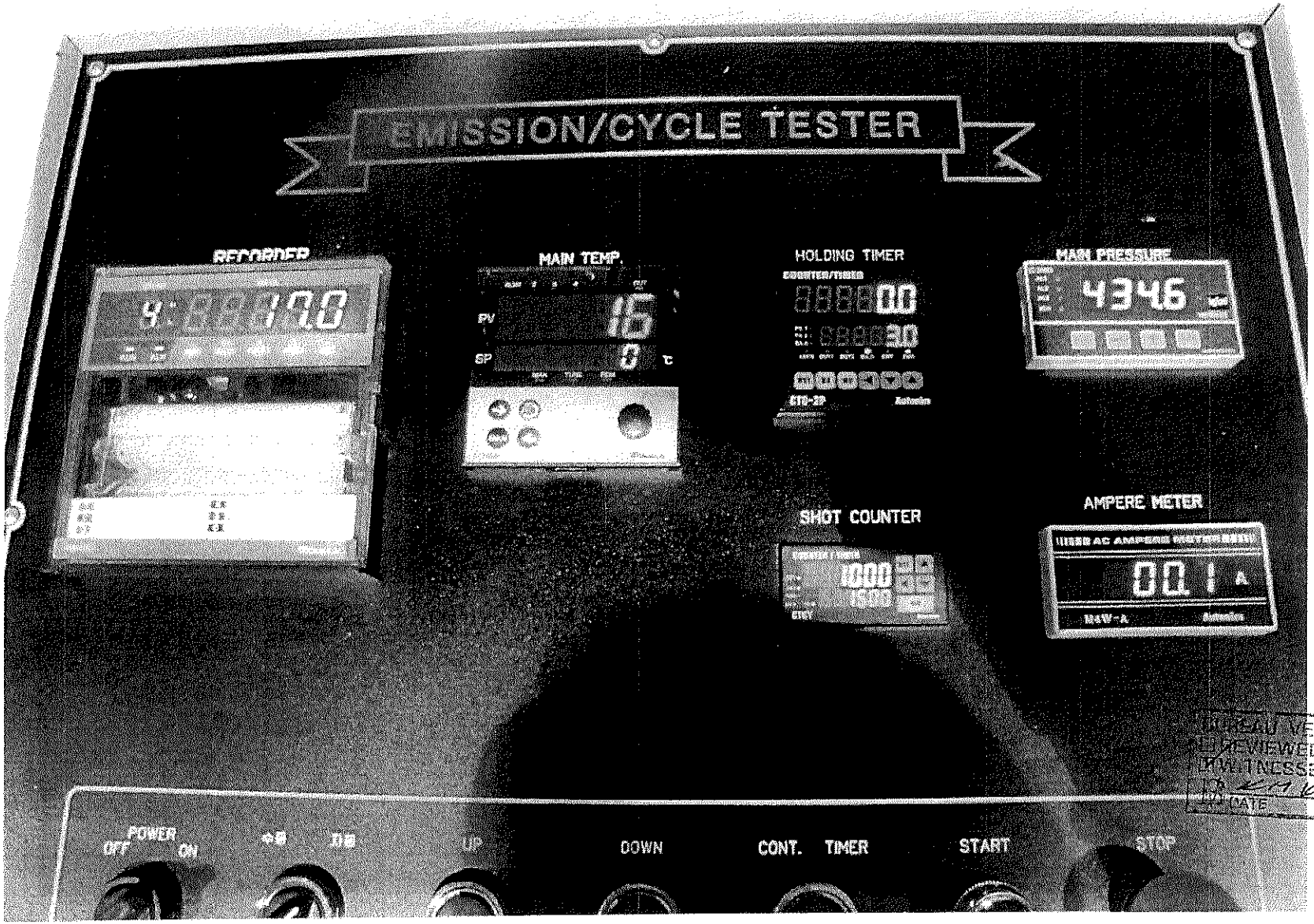
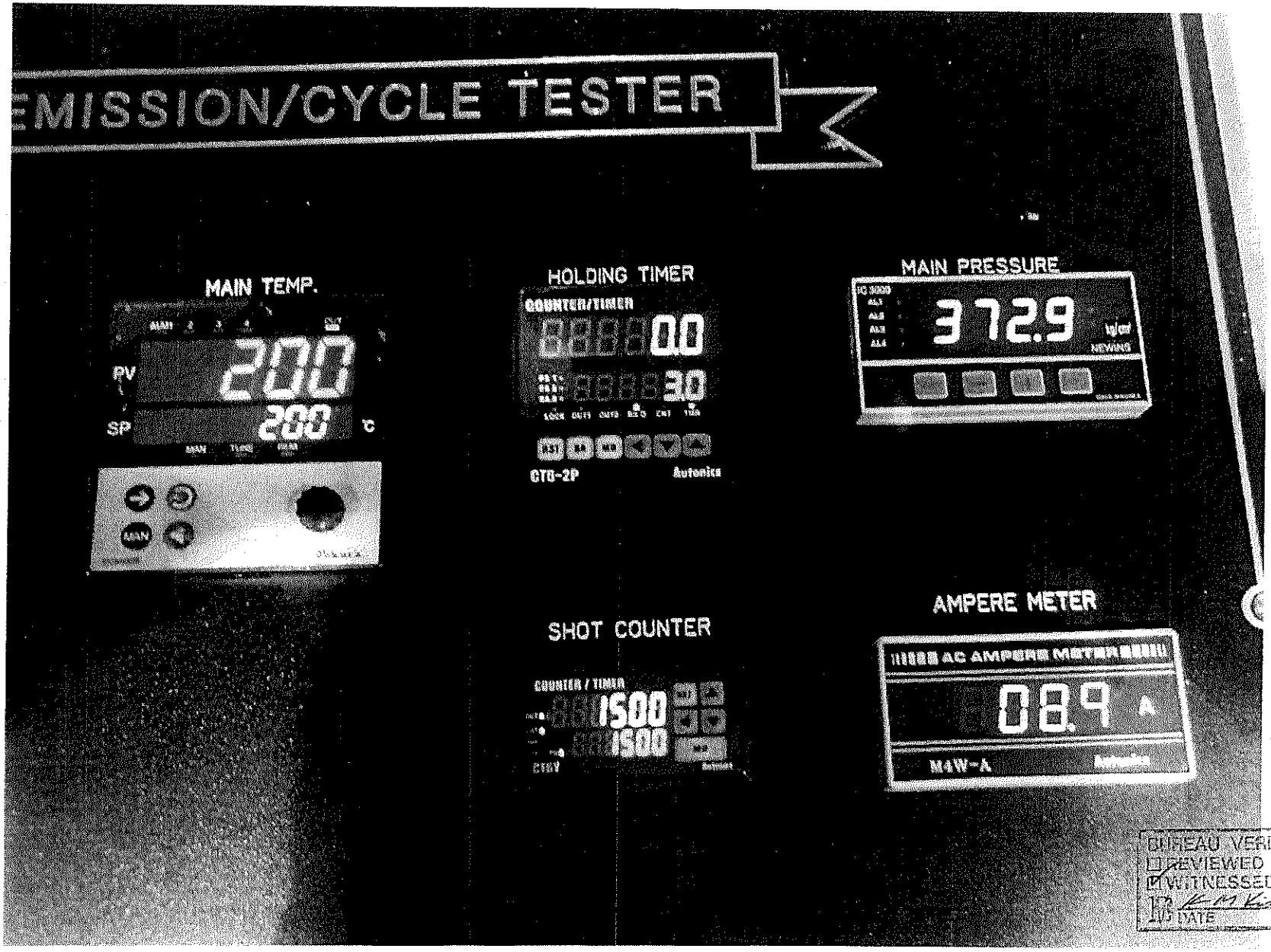
DATE







BUREAU VERITAS
☐ REVIEWED
☑ WITNESSED
DATE 22/12/2011

Energy & Process

TYPE APPROVAL CERTIFICATE FOR BALL VALVE
No. 940013/3-TC-07

B.V. Job Ref :3.30.1030.03
Inspection ordered to B.V. by (1) : SWI Valve Co. Ltd.

#1023-2 Gwanyang 1-dong Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Manufacturer : SWI Valve Co. Ltd., Korea

(1) the addressee of the original of this certificate ;

Description of the Supply / Subject of inspection :
Product : Casting Ball Valve
Size of Tested Valve : 2"
Material of Tested Valve : ASTM A216 WCB
Class of Tested Valve : #300
Stem Diameter : 25.0 mm
Tightness class : below 100ppm
Endurance class : 1500cycles
Temperature range : Room temperature to +200°C
Packing Adjustment number : 0

This certificate covers the whole of the supply: ☒ YES (no more inspection planned) ☐ NO (part of the supply still to be inspected)

Scope of the B.V. Survey :

- Witness for Type Test of Fugitive Emission Test

This supply complies with the following applicable document (s) : (2)
- API 622 Type Testing of Process Valve Packing for Fugitive Emissions

(2) and only for parts of the document(s) which concern the certification or the relevant service provided by Bureau Veritas.

List of enclosures: Test Report for Fugitive Emission Test ---------- 3 Pages

(or reference to enclosed list)
The certificate is valid together with enclosures (if listed). Only pages of enclosures (or parts of pages) which are stamped, are considered as part of this certificate.

Marking and Stamping on the items: NONE

Particulars or comments:
This is to certify that the following valves have been inspected by Bureau Veritas and found to be satisfactory in The Fugitive Emission Test in accordance with API 622 First Edition, August 2006.

Date of Issuance : 24-Mar-2011 Issued by :
Date of last inspection : 15 to 17-Feb-2011 Name : K. M. Kim

Sign :
Location of inspection : BV-Korea, Seoul Office

BUREAU VERITAS SEOUL 4 KOREA

This certificate is deliverered within the Scope of the General Conditions of Services of Bureau Veritas
Ce Certificat est délivré dans le cadre des Conditions Générales de Service du Bureau Veritas

Ad ME 9613b

PROTOTYPE TEST FOR VALVE
ACCORDING TO API 622 FIRST EDITION , AUGUST 2006.

- Fugitive Emission Test equipment specification

1. Manufacturer : SWI VALVE CO. LTD.
2. Address : 1023-2 Gwanyang 1-dong,Dongan-gu,
   Anyang-si, Gyeonggi-do, Korea
3. Date of Test : 15th Feb,2011 to 17th Feb,2011

1. VALVE SPECIFICATION

Valve size & type	2P-BALL VALVE WCB/316+RTFE RF FB 300# 2"
Material of Valve	A216-WCB
Valve class	300#
Stem diameter	25.0 mm
Gland packing type	Graphite Molded Packing
Packing material	FKM+Graphite
Operating torque	54N/m
Stroke/ Angle	Quarter-turn

2. TEST CONDITION

Test pressure	44 - 52 bar
Test medium	He 99%
Check medium	He 99%
Test temperature	RT/ 200℃
Test equipment	Fugitive emission test equip. manufactured by SWI VALVE CO. LTD.
Leakage measurement equipment	Helium Detector(ALCATEL Model ASM142 series)
Sampling method	Random
Valve repacking before test	0
Insulation of test valve	Heating Jacket used
Actuator	Geared motor

BUREAU VERITAS
☐ REVIEWED
☑ WITNESSED
DATE

A.1- Fugitive Emissions Test Report Summary

API Std 622

Fugitive Emissions Testing Report Number: SWI-FET-11

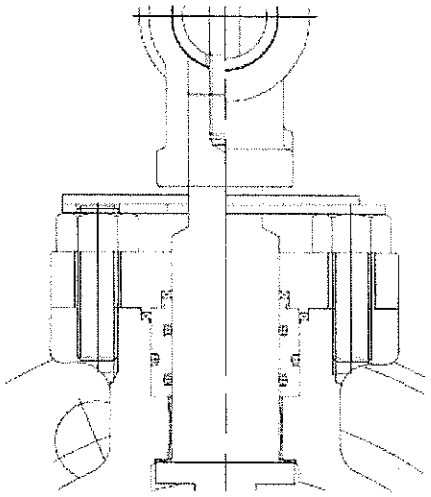
Application Profile : Check One ☑ Rotating ☐ Rising	Manufacturer: SWI VALVE CO. LTD. Description: 2-P Ball WCB 300# 2"
Testing Facility: SWI Factory Technician: Man-Jong,Ko Witness: Ki-Man , Kim Start date: 15TH Feb,2011 Completion: 17TH Feb,2011	Source: ☑ Manufacturer Date: 7th Feb,2011 ☐ Distributor Packaged: Indicate New or ☐ New Current Product ☑ Current
Gland Load Information psi. Gland Nut Torque : 39 ft-lbs	
Notes concerning installation instructions	

Testing Profile Details

Test Segment	Leak measurement (500 ppm)	Temperature(℃)	Reference Temperature(℃) at packing gland	Flats Adjusted-Gland Nut Torque ft-lbs	Reference A Height (mm)	
Day1 Start,Ambient 0-250 cycles P=52 (bar)	0	Room temp.	Room temp.	39	44.50	
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
High Temperature 250-500cycles P=44(bar)	0	200℃	176℃			
	0	200℃	176℃			
	0	200℃	176℃			
	1	200℃	176℃			
	2	200℃	176℃			
Day2 Start,Ambient 500-750 cycles P=52(bar)	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
	2	Room temp.	Room temp.			
	3	Room temp.	Room temp.			
	3	Room temp.	Room temp.			
	5	Room temp.	Room temp.			
High Temperature 750-1000 cycles P=44(bar)	12	200℃	176℃			
	13	200℃	176℃			
	15	200℃	176℃			
	15	200℃	176℃			
	16	200℃	176℃			
Day3 Start,Ambient 1000-1250 cycles P=52(bar)	8	Room temp.	Room temp.			
	9	Room temp.	Room temp.			
	10	Room temp.	Room temp.			
	11	Room temp.	Room temp.			
	11	Room temp.	Room temp.			
	12	Room temp.	Room temp.			
High Temperature 1250-1500cycles P=44(bar)	15	200℃	176℃			
	16	200℃	176℃			
	18	200℃	176℃			
	18	200℃	176℃			
	23	200℃	176℃			

A grqph depicting the test profile with associated leak checks and reajustments shall be provide by the testing authority.

BUREAU VERITAS
☐ REVIEWED
☑ WITNESSED
DATE

API Std 622 Emissions Testing Report Summary	
Test Number: SWI-FET-11	Test Date: 15TH to 17TH Feb,2011
Packing Material: FKM+ Graphite	Style Number:
Packing Manufacturer: PPE	Source of Sample: 2-P BALL WCB/316+RTFE RF FB 300# 2"
Test Packing Cross-section: (circular) o-ring / Rectangle	Laboratory Name: SWI LABORATORY Location of Test: SWI FACTORY
Packing Gland OD and ID(at the packing): OD= 34.6 ID= 25	Packing Gland Bolt Diameter= 12.7mm
Number of Mechanical Cycles: 750	Packing Compression % of Free Height= 100 % Torque on Gland Nuts(each side)= 39/ 39 (ft-lbs)
Number of Thermal Cycles: 750 Maximum Test Pressure : 52 bar	Mechanical Cycles Prior to Readjustment: Non-applicable Number of Readjustments: 0
Packing Configuration: FKM + GRAPHITE Number of rings tested: 3 Oring + 2 GRAPHITE Circle the following Ring shape(square, circular, vee) Solid or split Braided Die formed Spool stock Wire or other reinforcement Corrosion inhibitor &type Other	Show Sketch of Packing Installation-define each ring: 

TEST CHECKED BY :	TEST APPROVED BY :
Man Jong , Ko	Yong Pyo, Cho
DATE: MAR 16TH , 2011	DATE: : MAR 16TH, 2011

BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE 17/03/16 (2011)

Energy & Process

TYPE APPROVAL CERTIFICATE FOR FLOATING BALL VALVE
No. 940013/3-TC-08

B.V. Job Ref :3.30.1030.03
Inspection ordered to B.V. by (1) : SWI Valve Co. Ltd.

#1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Manufacturer : SWI Valve Co. Ltd., Korea

(1) the addressee of the original of this certificate :

Description of the Supply / Subject of inspection :
Product : Casting Ball Valve
Size of Tested Valve : 2"
Material of Tested Valve : ASTM A216 WCB
Class of Tested Valve : #300
Stem Diameter : 25.0 mm
Tightness class : AH
Endurance class : CO2(1500cycles)
Temperature class : t200°C
Valves Qualified according to sizes : up to 8" (Stem Dia. : 12.5 to 50.0 mm)
Valves Qualified according to pressure ratings : #150, #300
Valves Qualified according to tightness class : AH
Valves Qualified according to Endurance class : CO2(1500cycles)
Valves Qualified according to temperature class : Room temperature to +200°C
This certificate covers the whole of the supply: ☒ YES (no more inspection planned) ☐ NO (part of the supply still to be inspected)

Scope of the B.V. Survey :

- Witness for Type Test of Fugitive Emission Test

This supply complies with the following applicable document (s) : (2)
- ISO 15848-1 Industrial Valves-Measurement, Test and Qualification Procedure for Fugitive Emission
(2) and only for parts of the document(s) which concern the certification or the relevant service provided by Bureau Veritas.

List of enclosures: Test Report for Fugitive Emission Test ---------- 6 Pages
(or reference to enclosed list)
The certificate is valid together with enclosures (if listed). Only pages of enclosures (or parts of pages) which are stamped, are considered as part of this certificate

Marking and Stamping on the items: NONE

Particulars or comments:
This is to certify that the following valves have been inspected by Bureau Veritas and found to be satisfactory in The Fugitive Emission Test in accordance with ISO 15848-1 Edition2006.

Date of Issuance : 24-Mar-2011 Issued by :
Date of last inspection : 16 to 17-Feb-2011 Name : K. M. Kim

Sign :
Location of inspection : BV-Korea, Seoul Office

BUREAU VERITAS SEOUL 4 KOREA

This certificate is deliverered within the Scope of the General Conditions of Services of Bureau Veritas
Ce Certificat est délivré dans le cadre des Conditions Générales de Service du Bureau Veritas

This certificate is issued further to an inspection whose duration and scope were limited by the terms and conditions of the contract with BV principal. This certificate is NOT an indication that the item(s) is (are) fit for any specific purpose and does not release the manufacturer, supplier and any party from their respective duty, guarantee, obligation and/or indemnity relating to, without limitation, patents, workmanship, materials, safety, performance in operation and/or reliability.

Ac ME 9813b

PROTOTYPE TEST FOR VALVE
ACCORDING TO ISO 15848-1 Edition 2006

- Fugitive Emission Test equipment specification

1. Manufacturer : SWI VALVE CO. LTD.
2. Address : 1023-2 Gwanyang 1-dong,Dongan-gu,
   Anyang-si, Gyeonggi-do, Korea
3. Date of Test : 16th Feb,2011 to 17th Feb,2011

1. VALVE SPECIFICATION

Valve size & type	2-P BALL 300# WCB/316+RTFE RF FB 2"
Material of Valve	A216 WCB
Valve class	300#
Stem diameter	25.0 mm
Gland packing type	Graphite Molded Packing
Packing material	FKM+Graphite
Operating torque	54N/m
Stroke/ Angle	Quarter-turn

2. TEST CONDITION

Test pressure	44-52 bar
Test medium	He 99%
Check medium	He 99%
Test temperature	RT/ 200℃
Test equipment	Fugitive emission test equip. manufactured by SWI VALVE CO. LTD.
Leakage measurement equipment	Helium Detector(ALCATEL Model ASM142 series)
Sampling method	Random
Valve repacking before test	0
Insulation of test valve	Heating Jacket used
Actuator	Geared motor

BUREAU VERITAS
☐ REVIEWED
☑ WITNESSED
DATE 17/Feb/2011

3. CONDITION FOR CYCLING TEST

Number of step test cycles	4
Number of cycles for step	125
Number of step test cycles	2
Number of cycles for step	500
Number of step cycles at high temperature	3
The duration of the cycle stroke	12sec. (open 5sec. +stem movement 2sec.+close 5sec.)

4. DOCUMENTATION USED

Industrial Valves- Measurement test and qualification procedures for fugitive emission Spec. ISO 15848-1 Edition 2006.

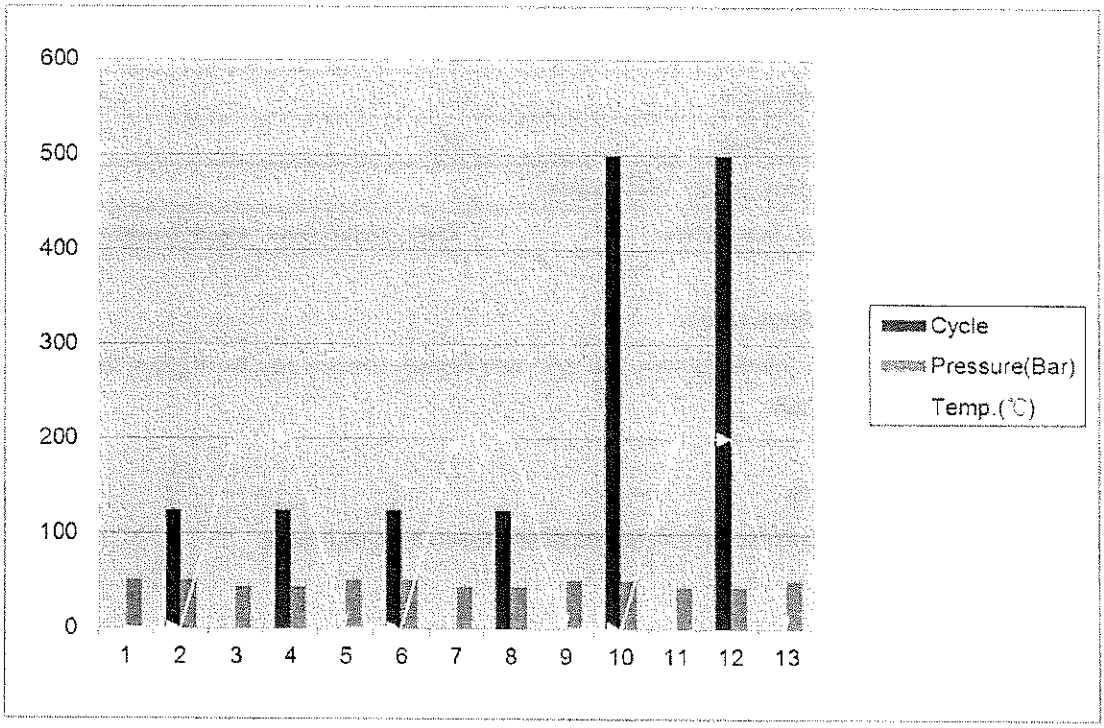
5. TEST RESULTS

Test results are recorded in manufactures test report from next page.

BUREAU VERITAS
☐ REVIEWED
☑ WITNESSED
DATE

6. TEST STEPS

The below graph specifies fluctuation of the 3 factors over total of 13 test steps.



7. TEST TABLE

The following table describes total of 13 steps and leakage rates in order.

TEST FROM ROOM TEMPERATURE TO +200℃

BUREAU VERITAS
☐ REVIEWED
☑ WITNESSED
DATE

Step 1. PRELIMINERY TESTS AT THE ROOM TEMPERATURE

Pres. (BAR)	Body Temp.(℃)	Body-Bonnet Leakage(PPM)	Packing leakage (atm x cm^3 x s^{-1})
52	Room. Temp.	0	1.0×10^{-7}

Step 2. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	52	Room. Temp.	1.5×10^{-7}

Step 3. STATIC TEST AT THE SELECTED TEST TEMPERATURE 200℃

Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
44	200	1.6×10^{-7}

Step 4. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 200℃

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	44	200	2.5×10^{-7}

Step 5. INTERMEIATE STATIC TESTS AT THE ROOM TEMPERATURE

Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
52	Room. Temp.	3.2×10^{-7}

Step 6. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	52	Room. Temp.	2.9×10^{-7}

Step 7. STATIC TEST AT THE SELECTED TEST TEMPERATURE 200℃

Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
44	200	3.4×10^{-7}

Step 8. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 200℃

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	44	200	3.6×10^{-7}

Step 9. INTERMEIATE STATIC TESTS AT THE ROOM TEMPERATURE

Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
52	Room. Temp.	4.2×10^{-7}

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☐ REVIEWED
☑ WITNESSED
DATE

Step 10. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage ((atm x cm^3 x s^{-1})
500	52	Room. Temp.	4.0×10^{-7}

Step 11. STATIC TEST AT THE SELECTED TEST TEMPERATURE 200℃

Pres. (BAR)	Body Temp.(℃)	Packing leakage(atm x cm^3 x s^{-1})
44	200	3.6×10^{-7}

Step 12. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 200℃

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
500	44	200	4.2×10^{-7}

Step 13. FINAL TEST AT THE ROOM TEMPERAURE

Pres. (BAR)	Body Temp.(℃)	Body-Bonnet leakage(PPM)	Packing leakage (atm x cm^3 x s^{-1})
52	Room Temp.	15	4.1×10^{-7}

POST TEST EXAMINATION

No visible damage and wear on stem packing area

BUREAU VERITAS
REVIEWED
WITNESSED
DATE 11/Feb/2011

ACCEPTANCE TIGHTNESS CLASS

	CLASS A
Body & bonnet gasket seal	≤50 ppmv
Stuffing box stem seal	$\leq 10^{-6}(mg x s^{-1} x m^{-1})$ Equivalent to $\leq 5.6 x 10^{-6}(atm \times cm^3 \times s^{-1})$

Maximum allowable tightness leakages based on actual dimensions of stuffing box packing seals with :

- stuffing box packing seal : stem diameter 25.0 mm

	CLASS A
Stuffing box stem seal	Stem diameter(0.025m)x π x5.56x 10^{-6} $(atm \times cm^3 \times s^{-1})$ = $4.4 x 10^{-7}$ $(atm \times cm^3 \times s^{-1})$

Conclusion : values observed quality valve to :

TIGHTNESS CLASS : AH

With no packing adjusted**≤SSA0>** for re tightening

ENDURANCE CLASS :

CO2 1,500 cycles

TEMPERAUTRE CLASS:

Room temperature to 200℃

Performance class : **ISO FE AH- CO2 – SSA0 – t- (200℃)-CL600- ISO 15848-1**

BUREAU VERITAS
☐ REVIEWED
☑ WITNESSED
DATE

TEST CHECKED BY :	TEST APPROVED BY :
Man Jong , Ko	Yong Pyo, Cho
DATE: MAR 16TH , 2011	DATE: : MAR 16TH, 2011

Certified ISO 9001 by BVQI

SWI VALVE

SWI Valve Co., Ltd.
Head office & Plant 1 : 1023-2 Gwanyang-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea Tel +82 31 421 1831~3 Fax +82 31 421 1834
Plant 2 : 801-2 Gongseom-ri, Cheongbuk-myeon, Pyeongtaek-si, Gyeonggi-do, Korea Tel +82 31 684 2981~3 Fax +82 31 684 2984 www.swivalve.com

TEST/INSPECTION CERTIFICATE

DATE : 2011. 02. 07

SWI ORDER NO. : SO2010100089

CERTIFICATE NO. : 100089-1

PROJECT NAME / NO: Fugitive Emission Test Sample

CUSTOMER/CLIENT : SWI Valve Co., Ltd.

PO NO.:

TAG NO.	ITEM DESCRIPTION	Class Press -ure	SIZE (inch)	Q'ty	Hydrostatic Test (kg/cm^2)		Air Test (kg/cm^2)	Materials(ASTM)				Dimen -sion Check	Visual Inspe -ction	Functi -onal Test	Result
					Shell	Seat / Backseat	Seat	Body & Bonnet	Seat Ring (Seat)	Stem	Wedge/ Disc (Ball)				
	2-P BALL V/V RF	300#	2"	1	80	N.A	7	A216-WCB	RTFE	A276-316	A276-316	GOOD	GOOD	GOOD	ACCEPTED

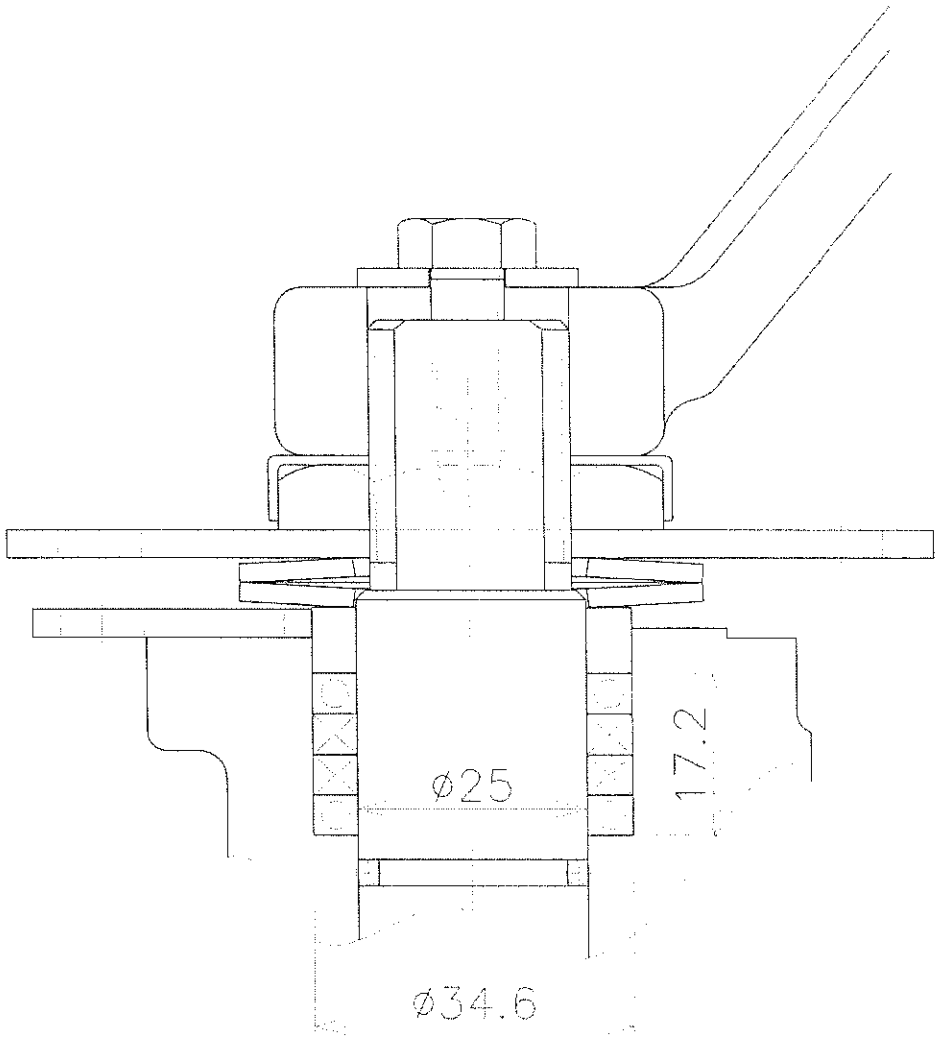
Remarks
1. These standard for inspection conform to API 598
2. HF : STELLITE NO. 6 Hard Facing

BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE 12/Feb/2011

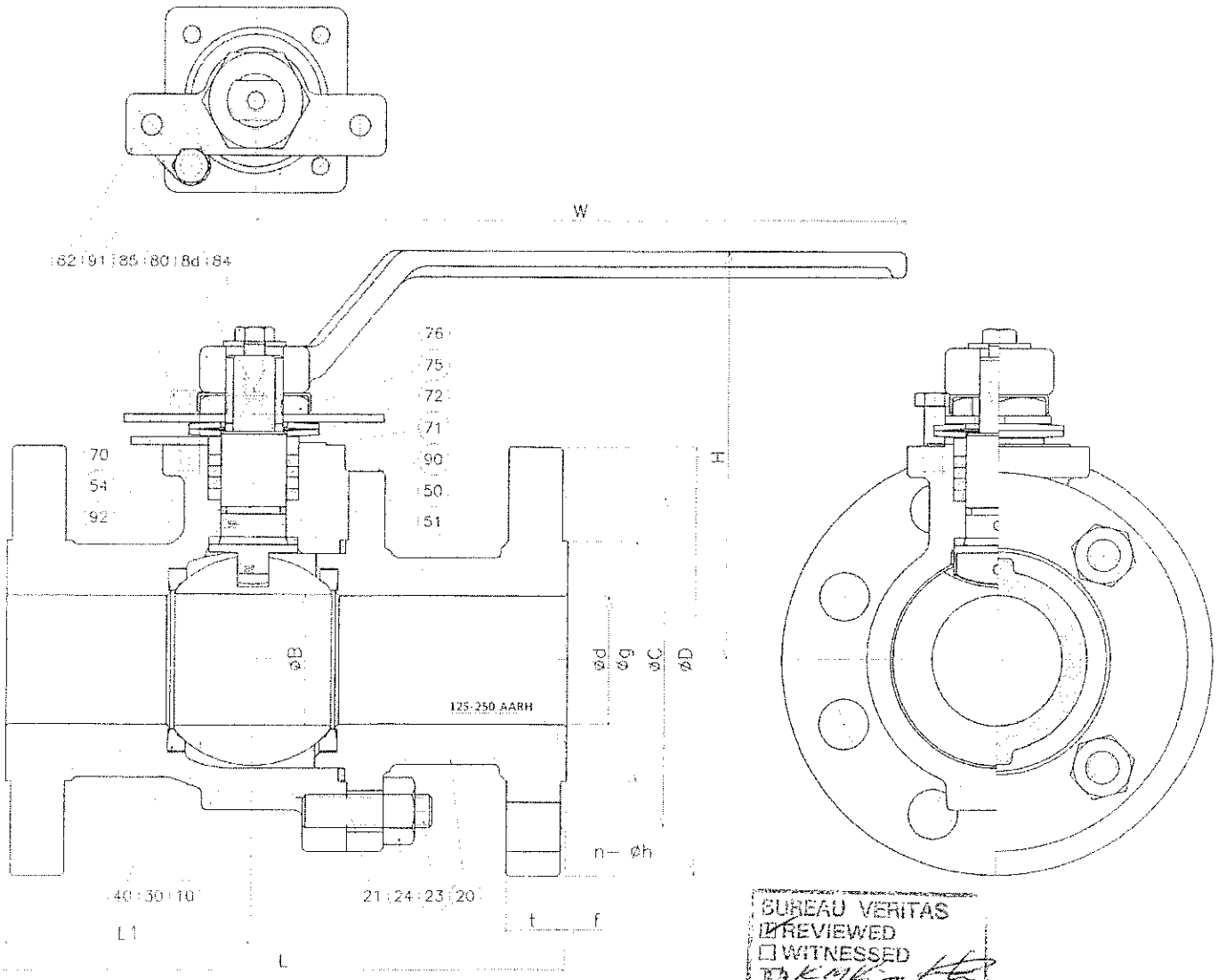
Witnessed / Reviewed by Customer Rep.

Q.A Manager

WE HEREBY CERTIFY THAT THE RESULTS MENTIONED ABOVE ARE TRUE AND CORRECT IN EVERY DETAIL



BALL



BILL OF MATERIALS

NO.	PART NAME	MATERIAL	Q'TY
10	BODY	A216-WCB	1
20	CAP	A216-WCB	1
21	CAP GASKET	316SS SPW + Graphite	1
23	CAP BOLT	A193-B8M Cl.2	1 set
24	CAP NUT	A194-8MA	1 set
30	BALL	A351 CF8M / A276 316	1
40	SEAT RING	RTFE	2
50	STEM	A276-316	1
51	THRUST SEAL	RTFE	2
54	STEM SEAL	VITON	1
70	PACKING	Graphite	1 set
71	GLAND	A276-316	1
72	GLAND WASHER	SPRING STEEL	2
75	STEM NUT	316SS	1
76	ANTI-LOOSE WASHER	316SS	1
80	LEVER	A395	1
82	STOP PLATE	A240-316	1
84	LEVER SET BOLT	A193-B8M	1
85	STOP BOLT	A193-B8M	1
8d	LEVER WASHER	A240-316	1
90	NAME PLATE	A240-316	1
91	LOCKING PLATE	A240-316	1
92	ANTI STATIC DEVICE	INCONEL X-750	2

SWI Valve Co., Ltd.

HYUNDAI HEAVY INDUSTRIES CO., LTD.

PTT Exploration and Production

BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE

Size (inch)	øB	L	L1	W	H	End Connection							Weight (kg)
						ød	øg	øC	øD	t	f	n- øh	
2 x 2	49	216	95	250	156	49	92.1	127.0	165	20.7	2	8- ø19	20
3 x 3	76	282	118	400	217	76	127.0	168.3	210	27.0	2	8- ø22	39
4 x 4	100	305	138	400	236	100	157.2	200.0	255	30.2	2	8- ø22	57

REV.	DATE	DESCRIPTIONS	DRAWN	CHK'D	APP'D
0	19.Nov.2010	Issued for Comments	M.G.HONG	J.B.CHOI	K.H.JUNG

STANDARD
END CONNECTION : RF (ASME B16.5)
VALVE DESIGN : API 6D / ASME B16.34 / GS EP PVV 151
FIRESAFE CERT. : API 607 / API 6FA / BS 6755 Part II
VALVE FINISHING : P96A 2 (GS EP COR 350)

PROJECT : BONGKOT FIELD DEVELOPMENT PROJECT - Phase 4A

DRAWING NO. : 11031961-04

TITLE : CAST STEEL 2-P BALL VALVE
CLASS 300 FLG'D FULL BORE

2014 ELP Compliance Status Report
Consent Decree No. 1:11-cv-13330-TLL-CEB

See Corresponding Tab in the Confidential Binder for Relevant Documentation

Orbit Response

Smith, Vanessa (A)

From: Smith, Vanessa (A)
Sent: Thursday, February 07, 2013 12:12 PM
To: 'tom.stricklen@c-a-m.com'
Cc: DeVine, Dan (DJ); rchristian@columbiapipe.com; Burdick, Matthew (MJ); Dahl, Kathy (KA)
Subject: Orbit: 2013 Low E Technology
Attachments: FW: LDAR Low Fugitive Emission Questionnaire

Good Afternoon,

As you may recall, in late 2011 Dow Chemical Michigan Operations entered a Consent Decree requiring Low Emission valves and/or packing to be installed in the Covered Process Units. In early 2012, a questionnaire was sent to you to determine if your products met the specifications of the Consent Decree. Attached are the completed questionnaires and any supporting data that you provided.

Per the Consent Decree, each year we must revalidate the Low Emission valves and/or packing determinations. Please review the attached information that you provided in 2012 upon which we based our original determination. Once reviewed, please reply to the questions below:

1. **Are the valves or packing that met the Low-E definition per the Dow Chemical Consent Decree in 2012 last year still Low-E? See definition below.**

2. **Do you have any valves or packing that qualify as Low-E per the definitions below since the last time the questionnaire was answered? If yes, please include the testing data.**

"Low-Emissions Valve" or "Low-E Valve" shall mean either (i) or (ii) as follows:

(i) A valve (including its specific packing assembly) for which the manufacturer has issued a written warranty that it will not emit fugitives at greater than 100 ppm, and that, if it does so emit at any time in the first five years, the manufacturer will replace the valve; provided however, that no valve shall qualify as "Low-E" by reason of written warranty unless the valve (including its specific packing assembly) either:

(a) first was tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions and the results of the testing reasonably support the warranty; or

(b) is as an Extension of another valve that qualified as "Low-E" per the definition of "Extension" listed below.

Or

(ii) A valve (including its specific packing assembly) that:

(a) Has been tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions and that, during the test, at no time leaked at greater than 500 ppm, and on average, leaked at less than 100 ppm; or

(b) Is an Extension of another valve that qualified as "Low-E" per the definition of "Extension" listed below.

NOTE: "Extension" shall mean that: (i) the tested and untested valves were produced by the same manufacturer to the same or essentially equivalent quality requirements; (ii) the characteristics of the valve that affect sealing performance (e.g., type of valve, stem motion, tolerances, surface finishes, loading arrangement, and stem and body seal material, design, and construction) are the same or essentially equivalent as between the tested valve and the untested valve; and (iii) the temperature and pressure ratings of the tested valve are at least as high as the temperature and pressure ratings of the untested valve.

Thank you for your time and assistance with this matter. **All responses must be received by February 28th** in order for us to review and make our 2013 determinations.
Sincerely,

Vanessa Smith
Environmental Delivery Specialist
Dow Automotive/Dow Pharma
Office: (989) 638-7774
Cell: (989) 213-7258

Parker
No Response

Smith, Vanessa (A)

From: Smith, Vanessa (A)
Sent: Wednesday, February 13, 2013 11:34 AM
To: 'rkyes@parker.com'
Cc: Dahl, Kathy (KA); Burdick, Matthew (MJ); DeVine, Dan (DJ); 'Russ Christian'
Subject: Parker 2013 Low E Technology Determination
Attachments: DOW Michigan Low-E Valve Questionnaire.docx

Good Morning,

As you may recall, in late 2011 Dow Chemical Michigan Operations entered a Consent Decree requiring Low Emission valves and/or packing to be installed in the Covered Process Units. In early 2012, a questionnaire was sent to you to determine if your products met the specifications of the Consent Decree. Unfortunately, we did not receive a completed questionnaire in 2012. We are now working on our 2013 Low Emission Technology determinations according to the Consent Decree and attached is the questionnaire that was previously sent.

Could you please review and complete the questionnaire? Also, please provide any applicable testing data.

Thank you for your time and assistance with this matter. **All responses must be received by February 28th** in order for us to review and make our 2013 determinations.
Sincerely,

Vanessa Smith
The Dow Chemical Company
Environmental Delivery Specialist
Office: (989) 638-7774
Cell: (989) 213-7258

Swagelok Response

Smith, Vanessa (A)

From: Smith, Vanessa (A)
Sent: Thursday, February 07, 2013 12:12 PM
To: 'Volcansek, Steven J.'; Kreutzberg, Clark T.; Wilson, Chelsea; Wilson, Richard
Cc: DeVine, Dan (DJ); rchristian@columbiapipe.com; Burdick, Matthew (MJ); Dahl, Kathy (KA)
Subject: Swagelok: 2013 Low E Technology
Attachments: Swagelok - Fugitive Emissions Letter ; EPA; FW: dow questionaire; RE: Scope of product for Dow FE testing

Good Afternoon,

As you may recall, in late 2011 Dow Chemical Michigan Operations entered a Consent Decree requiring Low Emission valves and/or packing to be installed in the Covered Process Units. In early 2012, a questionnaire was sent to you to determine if your products met the specifications of the Consent Decree. Attached are the completed questionnaires and any supporting data that you provided.

Per the Consent Decree, each year we must revalidate the Low Emission valves and/or packing determinations. Please review the attached information that you provided in 2012 upon which we based our original determination. Once reviewed, please reply to the questions below:

1. **Are the valves or packing that met the Low-E definition per the Dow Chemical Consent Decree in 2012 last year still Low-E? See definition below.**

2. **Do you have any valves or packing that qualify as Low-E per the definitions below since the last time the questionnaire was answered? If yes, please include the testing data.**

"Low-Emissions Valve" or "Low-E Valve" shall mean either (i) or (ii) as follows:

(i) A valve (including its specific packing assembly) for which the manufacturer has issued a written warranty that it will not emit fugitives at greater than 100 ppm, and that, if it does so emit at any time in the first five years, the manufacturer will replace the valve; provided however, that no valve shall qualify as "Low-E" by reason of written warranty unless the valve (including its specific packing assembly) either:

(a) first was tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions and the results of the testing reasonably support the warranty; or

(b) is as an Extension of another valve that qualified as "Low-E" per the definition of "Extension" listed below.

Or

(ii) A valve (including its specific packing assembly) that:

(a) Has been tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions and that, during the test, at no time leaked at greater than 500 ppm, and on average, leaked at less than 100 ppm; or

(b) Is an Extension of another valve that qualified as "Low-E" per the definition of "Extension" listed below.

NOTE: "Extension" shall mean that: (i) the tested and untested valves were produced by the same manufacturer to the same or essentially equivalent quality requirements; (ii) the characteristics of the valve that affect sealing performance (e.g., type of valve, stem motion, tolerances, surface finishes, loading arrangement, and stem and body seal material, design, and construction) are the same or essentially equivalent as between the tested valve and the untested valve; and (iii) the temperature and pressure ratings of the tested valve are at least as high as the temperature and pressure ratings of the untested valve.

Thank you for your time and assistance with this matter. **All responses must be received by February 28th** in order for us to review and make our 2013 determinations.
Sincerely,

Vanessa Smith
Environmental Delivery Specialist
Dow Automotive/Dow Pharma
Office: (989) 638-7774
Cell: (989) 213-7258

Holmes, Michael (EHS)

From: Volcansek, Steven J. [Steven.Volcansek@SWAGELOK.com]
Sent: Friday, February 15, 2013 8:35 AM
To: Kreutzberg, Clark T.; Krance, Joseph M.; Wilson, Chelsea; Smith, Vanessa (A); Wilson, Richard
Subject: RE: Swagelok: 2013 Low E Technology

Vanessa:

Thank you for asking Swagelok to update our status on Low E valves.

Please find below answers to your questions and our additions to the previous list of Low E capable products.

Feel free to contact me for with any questions.

Best Regards
Steve

Steven J. Volcansek
Manager - Corporate Compliance
31400 Aurora Rd.
Solon, Ohio 44139

440-649-5626

From: Smith, Vanessa (A) [mailto:VNowak3@dow.com]
Sent: Thursday, February 07, 2013 12:13 PM
To: Volcansek, Steven J.; Kreutzberg, Clark T.; Wilson, Chelsea; Wilson, Richard
Cc: DeVine, Dan (DJ); rchristian@columbiapipe.com; Burdick, Matthew (MJ); Dahl, Kathy (KA)
Subject: Swagelok: 2013 Low E Technology

Good Afternoon,

As you may recall, in late 2011 Dow Chemical Michigan Operations entered a Consent Decree requiring Low Emission valves and/or packing to be installed in the Covered Process Units. In early 2012, a questionnaire was sent to you to determine if your products met the specifications of the Consent Decree. Attached are the completed questionnaires and any supporting data that you provided.

Per the Consent Decree, each year we must revalidate the Low Emission valves and/or packing determinations. Please review the attached information that you provided in 2012 upon which we based our original determination. Once reviewed, please reply to the questions below:

1. **Are the valves or packing that met the Low-E definition per the Dow Chemical Consent Decree in 2012 last year still Low-E? See definition below. Yes.**

2. **Do you have any valves or packing that qualify as Low-E per the definitions below since the last time the questionnaire was answered? Yes. See below. If yes, please include the testing data. Swagelok will not provide test data at this time. Test summary results and methodology is available for review and discussion during an on-site visit at the Swagelok factory in Solon, Ohio.**
   Add R63T to 60 Series (Ball valves)
   83 Series (Ball valve)
   AFS Series (Ball valve)
   D Series (Globe valve)

"Low-Emissions Valve" or "Low-E Valve" shall mean either (i) or (ii) as follows:

(i) A valve (including its specific packing assembly) for which the manufacturer has issued a written warranty that it will not emit fugitives at greater than 100 ppm, and that, if it does so emit at any time in the first five years, the manufacturer will replace the valve; provided however, that no valve shall qualify as "Low-E" by reason of written warranty unless the valve (including its specific packing assembly) either:

(a) first was tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions and the results of the testing reasonably support the warranty; or

(b) is as an Extension of another valve that qualified as "Low-E" per the definition of "Extension" listed below.

Or

(ii) A valve (including its specific packing assembly) that:

(a) Has been tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions and that, during the test, at no time leaked at greater than 500 ppm, and on average, leaked at less than 100 ppm; or

(b) Is an Extension of another valve that qualified as "Low-E" per the definition of "Extension" listed below.

NOTE: "Extension" shall mean that: (i) the tested and untested valves were produced by the same manufacturer to the same or essentially equivalent quality requirements; (ii) the characteristics of the valve that affect sealing performance (e.g., type of valve, stem motion, tolerances, surface finishes, loading arrangement, and stem and body seal material, design, and construction) are the same or essentially equivalent as between the tested valve and the untested valve; and (iii) the temperature and pressure ratings of the tested valve are at least as high as the temperature and pressure ratings of the untested valve.

Thank you for your time and assistance with this matter. **All responses must be received by February 28th** in order for us to review and make our 2013 determinations.
Sincerely,

Vanessa Smith
Environmental Delivery Specialist
Dow Automotive/Dow Pharma
Office: (989) 638-7774

Cell: (989) 213-7258

Smith, Vanessa (A)

om: Ron Walters [ronw@TEADIT.com]
ent: Monday, February 25, 2013 3:38 PM
To: Smith, Vanessa (A)
Cc: DeVine, Dan (DJ); 'Russ Christian'; Burdick, Matthew (MJ); Dahl, Kathy (KA); Joel Baulch; Chris Day
Subject: RE: Teadit: 2013 Low E Technology
Attachments: API 607 Fire Test - Teadit - Style 2237 Packing- May 2012.pdf; API 622 Fugitive Emission Test Report - Teadit Style 2237 - May 2012 (1).pdf; EF2013_001 2237 Valvula Q-Plus ISO 15848 Rev1 (1).pdf; EF055 Q-Plus Valve.pdf

Vanessa,

The answer to question 1 is yes.

The answer to question 2 is yes, we have developed a graphitic control valve packing, Teadit Style 2237, which I am attaching testing information for your evaluation. Please note the test uses 5 cut rings of spool stock packing without live-loading.

I am going to be at your plant Thursday, February 28th for installation training on our 2236. If you need to have any discussion on the 2237 let Dan know and we can schedule some time after the training session.

Teadit has also developed a PTFE braided packing that we are filing patent registration and will be able to discuss in the near future. It tested single digit PPM Method 21 up to 500 deg. F in our test lab in Rio. I am the leader of MSS task group that completed a Scope for Fugitive Emissions test for PTFE products. I submitted to the API SCOPV chair and he has submitted for development by API. We should put the API task group together at our Spring meeting in April. I will keep you updated as it develops.

Warmest Regards,

Ron Walters
North America Product Manager
Fugitive Emissions Products
Cell: 985-513-0986
www.teadit-na.com

From: Smith, Vanessa (A) [VNowak3@dow.com]
Sent: Friday, February 15, 2013 10:55 AM
To: Ron Walters
Cc: DeVine, Dan (DJ); 'Russ Christian'; Burdick, Matthew (MJ); Dahl, Kathy (KA)
Subject: Teadit: 2013 Low E Technology

Good Afternoon,

As you may recall, in late 2011 Dow Chemical Michigan Operations entered a Consent Decree requiring Low Emission valves and/or packing to be installed in the Covered Process Units. In early 2012, a questionnaire was sent to you to determine if your products met the specifications of the Consent Decree. Attached are the completed questionnaires and any supporting data that you provided.

Per the Consent Decree, each year we must revalidate the Low Emission valves and/or packing determinations. Please review the attached information that you provided in 2012 upon which we based our original determination. Once reviewed, please reply to the questions below:

1. Are the valves or packing that met the Low-E definition per the Dow Chemical Consent Decree in 2012 last year still Low-E? See definition below.

2. Do you have any valves or packing that qualify as Low-E per the definitions below since the last time the questionnaire was answered? If yes, please include the testing data.

"Low-Emissions Valve" or "Low-E Valve" shall mean either (i) or (ii) as follows:

(i) A valve (including its specific packing assembly) for which the manufacturer has issued a written warranty that it will not emit fugitives at greater than 100 ppm, and that, if it does so emit at any time in the first five years, the manufacturer will replace the valve; provided however, that no valve shall qualify as "Low-E" by reason of written warranty unless the valve (including its specific packing assembly) either:

(a) first was tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions and the results of the testing reasonably support the warranty; or

(b) is as an Extension of another valve that qualified as "Low-E" per the definition of "Extension" listed below.

Or

(ii) A valve (including its specific packing assembly) that:

(a) Has been tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions and that, during the test, at no time leaked at greater than 500 ppm, and on average, leaked at less than 100 ppm; or

(b) Is an Extension of another valve that qualified as "Low-E" per the definition of "Extension" listed below.

NOTE: "Extension" shall mean that: (i) the tested and untested valves were produced by the same manufacturer to the same or essentially equivalent quality requirements; (ii) the characteristics of the valve that affect sealing performance (e.g., type of valve, stem motion, tolerances, surface finishes, loading arrangement, and stem and body seal material, design, and construction) are the same or essentially equivalent as between the tested valve and the untested valve; and (iii) the temperature and pressure ratings of the tested valve are at least as high as the temperature and pressure ratings of the untested valve.

Thank you for your time and assistance with this matter. All responses must be received by February 28th in order for us to review and make our 2013 determinations.
Sincerely,

Vanessa Smith
Environmental Delivery Specialist
Dow Automotive/Dow Pharma
Office: (989) 638-7774
Cell: (989) 213-7258

SWI Response

Smith, Vanessa (A)

From: Smith, Vanessa (A)
Sent: Wednesday, February 13, 2013 11:34 AM
To: 'rkim@swivalves.com'
Cc: 'Russ Christian'; Dahl, Kathy (KA); DeVine, Dan (DJ); Burdick, Matthew (MJ)
Subject: SWI 2013 Low E Technology Determination
Attachments: DOW Michigan Low-E Valve Questionnaire.docx

Good Morning,

As you may recall, in late 2011 Dow Chemical Michigan Operations entered a Consent Decree requiring Low Emission valves and/or packing to be installed in the Covered Process Units. In early 2012, a questionnaire was sent to you to determine if your products met the specifications of the Consent Decree. Unfortunately, we did not receive a completed questionnaire in 2012. We are now working on our 2013 Low Emission Technology determinations according to the Consent Decree and attached is the questionnaire that was previously sent.

Could you please review and complete the questionnaire? Also, please provide any applicable testing data.

Thank you for your time and assistance with this matter. **All responses must be received by February 28th** in order for us to review and make our 2013 determinations.
Sincerely,

Vanessa Smith
The Dow Chemical Company
nvironmental Delivery Specialist
ffice: (989) 638-7774
Cell: (989) 213-7258

Smith, Vanessa (A)

From: RONNIE KIM [rkim@swivalves.com]
Sent: Thursday, February 14, 2013 11:04 AM
To: Smith, Vanessa (A)
Cc: 'Russ Christian'; Dahl, Kathy (KA); DeVine, Dan (DJ); Burdick, Matthew (MJ)
Subject: RE: SWI 2013 Low E Technology Determination
Attachments: WinZip Compressed Attachments.zip; Low-E Valve Questionnaire.docx

See attached.

Ronnie Kim
SWI Valve Corporation
Ph#713-266-7033
Fax#281-261-7507
Cell#713-702-2864

From: Smith, Vanessa (A) [mailto:VNowak3@dow.com]
Sent: Wednesday, February 13, 2013 10:34 AM
To: rkim@swivalves.com
Cc: Russ Christian; Dahl, Kathy (KA); DeVine, Dan (DJ); Burdick, Matthew (MJ)
Subject: SWI 2013 Low E Technology Determination

Good Morning,

As you may recall, in late 2011 Dow Chemical Michigan Operations entered a Consent Decree requiring Low Emission valves and/or packing to be installed in the Covered Process Units. In early 2012, a questionnaire was sent to you to determine if your products met the specifications of the Consent Decree. Unfortunately, we did not receive a completed questionnaire in 2012. We are now working on our 2013 Low Emission Technology determinations according to the Consent Decree and attached is the questionnaire that was previously sent.

Could you please review and complete the questionnaire? Also, please provide any applicable testing data.

Thank you for your time and assistance with this matter. **All responses must be received by February 28th** in order for us to review and make our 2013 determinations.
Sincerely,

Vanessa Smith
The Dow Chemical Company
Environmental Delivery Specialist
Office: (989) 638-7774
Cell: (989) 213-7258

LOW FUGITIVE EMISSION VALVE AND PACKING QUESTIONNAIRE

Two production units at The Dow Chemical Company **Michigan Operations Site** recently came under a Consent Decree from the EPA. One part of this Consent Decree requires installation of Low Fugitive Emission valves and/or Low Fugitive Emission valve stem packing that meets the definition shown below. It also requires supporting documentation.

"Low-Emissions Valve" or "Low-E Valve" shall mean either (i) or (ii) as follows:

(i) A valve (including its specific packing assembly) for which the manufacturer has issued a written warranty that it will not emit fugitives at greater than 100 ppm, and that, if it does so emit at any time in the first five years, the manufacturer will replace the valve; provided however, that no valve shall qualify as "Low-E" by reason of written warranty unless the valve (including its specific packing assembly) either:

(a) first was tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions and the results of the testing reasonably support the warranty; or

(b) is as an Extension of another valve that qualified as "Low-E" per the definition of "Extension" listed below.

Or

(ii) A valve (including its specific packing assembly) that:

a. Has been tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions and that, during the test, at no time leaked at greater than 500 ppm, and on average, leaked at less than 100 ppm; or

b. Is an Extension of another valve that qualified as "Low-E" per the definition of "Extension" listed below.

NOTE: "Extension" shall mean that: (i) the tested and untested valves were produced by the same manufacturer to the same or essentially equivalent quality requirements; (ii) the characteristics of the valve that affect sealing performance (e.g., type of valve, stem motion, tolerances, surface finishes, loading arrangement, and stem and body seal material, design, and construction) are the same or essentially equivalent as between the tested valve and the untested valve; and (iii) the temperature and pressure ratings of the tested valve are at least as high as the temperature and pressure ratings of the untested valve.

Therefore can you please answer **ALL** of the following questions regarding valves that could be supplied to The Dow Chemical Company, Michigan Operations Site?

COMPANY NAME: ___SWI VALVE CORPORATION_____

1) Will your company provide a written warranty for low emission valves as defined above? YES or NO? Yes, per ii a & b.

   If YES, please describe the testing (the nature of the test and the resulting data) that supports the warranty.(see attached)

   OR

2) Does your company produce valves that have been proven through testing to meet the emission limits in the definition for low emission valves? YES

If yes to the above questions, what size and type of valves that your company produces will meet this definition or warranty? Please be specific as possible (i.e. which series of valves or models numbers).

Ball? CN, CS, CT series

Plug?

Gate? AAF, AAB, AAD, AAE, AAH series

Globe? ABF, ABB, ABD, ABE, ABH series

Butterfly?

Other? All bellowseal type gate, globe valves

3) Which valves, including sizes, were tested? (see attached)

4) Which valves, including sizes, are qualified per an extension?

5) Will you provide the test data to The Dow Chemical Company for review? If yes, please include it in the response.(see attached)

6) Does your Company offer a valve with low emission packing per the following definition?

"Low-Emissions Packing" or "Low-E Packing" shall mean either (i) or (ii) as follows:

(i) A valve packing product, independent of any specific valve, for which the manufacturer has issued a written warranty that the packing will not emit fugitives at greater than 100 ppm, and that, if it does so emit at any time in the first five years, the manufacturer will replace the product; provided however, that no packing product shall qualify as "Low-E" by reason of written warranty unless the packing first was tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions and the results of the testing reasonably support the warranty;

Or

(ii) A valve packing product, independent of any specific valve that has been tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions, and that, during the test, at no time leaked at greater than 500 ppm, and on average leaked at less than 100 ppm.

7) If yes, for which valves would "Low-E Packing" be offered? All valves

8) For which types of packing is "Low-E" status based on a written warranty?

9) For which types of packing is "Low-E" status based on testing that shows the packing meets the emission limits in the definition above? (see attached packing spec)

10) If yes, can this Low-E Packing testing information be provided to The Dow Chemical Company for review? If yes, please include it with the response. (see attached)

Thank you for your assistance to help meet low emission compliance.

Please contact Dan DeVine at 989-636-4330, or by email at devinedj@dow.com with questions or clarifications.

Smith, Vanessa (A)

From: Smith, Vanessa (A)
Sent: Monday, February 25, 2013 10:56 AM
To: 'RONNIE KIM'
Cc: 'Russ Christian'; Dahl, Kathy (KA); DeVine, Dan (DJ); Burdick, Matthew (MJ)
Subject: RE: SWI 2013 Low E Technology Determination

Ronnie,

Thank you for your response to our questions concerning Low Emission valves. In the zipped file, we noticed that there were only summary sheets of each test performed. Would you be able to provide us with the full test reports so we can fully evaluate our determinations? If this is confidential data, please indicate as appropriate and we will respect the sensitivity.

Regards,
Vanessa

From: RONNIE KIM [mailto:rkim@swivalves.com]
Sent: Thursday, February 14, 2013 11:04 AM
To: Smith, Vanessa (A)
Cc: 'Russ Christian'; Dahl, Kathy (KA); DeVine, Dan (DJ); Burdick, Matthew (MJ)
Subject: RE: SWI 2013 Low E Technology Determination

See attached.

Ronnie Kim
SWI Valve Corporation
Ph#713-266-7033
Fax#281-261-7507
Cell#713-702-2864

From: Smith, Vanessa (A) [mailto:VNowak3@dow.com]
Sent: Wednesday, February 13, 2013 10:34 AM
To: rkim@swivalves.com
Cc: Russ Christian; Dahl, Kathy (KA); DeVine, Dan (DJ); Burdick, Matthew (MJ)
Subject: SWI 2013 Low E Technology Determination

Good Morning,

As you may recall, in late 2011 Dow Chemical Michigan Operations entered a Consent Decree requiring Low Emission valves and/or packing to be installed in the Covered Process Units. In early 2012, a questionnaire was sent to you to determine if your products met the specifications of the Consent Decree. Unfortunately, we did not receive a completed questionnaire in 2012. We are now working on our 2013 Low Emission Technology determinations according to the Consent Decree and attached is the questionnaire that was previously sent.

Could you please review and complete the questionnaire? Also, please provide any applicable testing data.

Thank you for your time and assistance with this matter. **All responses must be received by February 28th** in order for us to review and make our 2013 determinations.
Sincerely,

Vanessa Smith
The Dow Chemical Company
Environmental Delivery Specialist
Office: (989) 638-7774
Cell: (989) 213-7258

BUREAU VERITAS

Energy & Process

TYPE APPOROVAL CERTIFICATE FOR GATE VALVE
No. 940013/3-CT-01

B.V. Job Ref: 3.30.1030.03

Inspection ordered to B.V. by (1) : SWI Valve Co. Ltd.
#1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Manufacturer : SWI Valve Co. Ltd., Korea

(1) the addressee of the original of this certificate ;

Description of the Supply / Subject of inspection :

Product : Forged Steel Gate Valve
Size of Tested Valve : 1"
Material of Tested Valve : ASTM A105N
Class of Tested Valve : #800
Stem Diameter : 11.1 mm
Tightness class : BH
Endurance class : CO2(1500cycles)
Temperature class : t400℃

Valves Qualified according to sizes : up to 2" (Stem Dia. : 5.5 to 22.2 mm)
Valves Qualified according to pressure ratings : #150 , #300 , #600, #800
Valves Qualified according to tightness class : BH
Valves Qualified according to Endurance class : CO2(1500cycles)
Valves Qualified according to temperature class : Room temperature to +400℃

This certificate covers the whole of the supply: ☒ YES (no more inspection planned) ☐ NO (part of the supply still to be inspected)

Scope of the B.V. Survey :

- Witness for Type Test of Fugitive Emission Test

This supply complies with the following applicable document (s) : (2)

- ISO 15848-1 Industrial Valves-Measurement, Test and Qualification Procedure for Fugitive Emission

(2) and only for parts of the document(s) which concern the certification or the relevant service provided by Bureau Veritas.

List of enclosures: Test Report for Fugitive Emission Test ———— 9 Pages

(or reference to enclosed list)
The certificate is valid together with enclosures (if listed). Only pages of enclosures (or parts of pages) which are stamped, are considered as part of this certificate.

Marking and Stamping on the items: **None**

Particulars or comments:
This is to certify that the following valves have been inspected by Bureau Veritas and found to be satisfactory in The Fugitive Emission Test in accordance with ISO 15848-1 Edition 2006.

Date of Issuance : 07-July-2010
Date of Inspection : 14 to 16-Jun-2010

Issued by :
Name : K. M. Kim
Sign :

Validated by :
Name : Y. M. Moon
Sign :

BUREAU VERITAS SEOUL 3 KOREA

Location of Inspection : BV-Korea, Seoul Office

PROTOTYPE TEST FOR VALVE
ACCORDING TO ISO 15848-1 Edition 2006

- Fugitive Emission Test equipment specification

1. Manufacturer : SWI VALVE CO. LTD.
2. Address : 1023-2 Gwanyang 1-dong,Dongan-gu,
   Anyang-si, Gyeonggi-do, Korea
3. Date of Test : 14th June,2010 to 16th June,2010

1 VALVE SPECIFICATION

Valve size & type	GATE Valve A105N/13CRFS SW 800# BB RB 1"
Material of Valve	A105N
Valve class	800#
Stem diameter	11.1 mm
Gland packing type	Graphite Braided Packing+Graphite Molded Packing Model No. : DAEWHA 6511+ 9001
Packing material	Graphite , Graphite + Inconel Wire
Operating torque	41 N/m
Stroke	24.3 mm

2TEST CONDITION

Test pressure	136-93bar
Test medium	He 99%
Check medium	He 99%
Test temperature	RT/ 400℃
Test equipment	Fugitive emission test equip. manufactured by SWI VALVE CO. LTD.
Leakage measurement equipment	Helium Detector(ALCATEL Model ASM142 series)
Sampling method	Random
Valve repacking before test	0
Insulation of test valve	Heating Jacket used
Actuator	Geared motor

BUREAU VERITAS
☒ REVIEWED
☒ WITNESSED
DATE

3CONDITION FOR CYCLING TEST

Number of step test cycles	4
Number of cycles for step	125
Number of step test cycles	2
Number of cycles for step	500
Number of step cycles at high temperature	3
The duration of the cycle stroke	14sec. (open 2" + stem movement 8"+ close 2")

4DOCUMENTATION USED

Industrial Valves- Measurement test and qualification procedures for fugitive emission Spec. ISO 15848-1 Edition 2006.

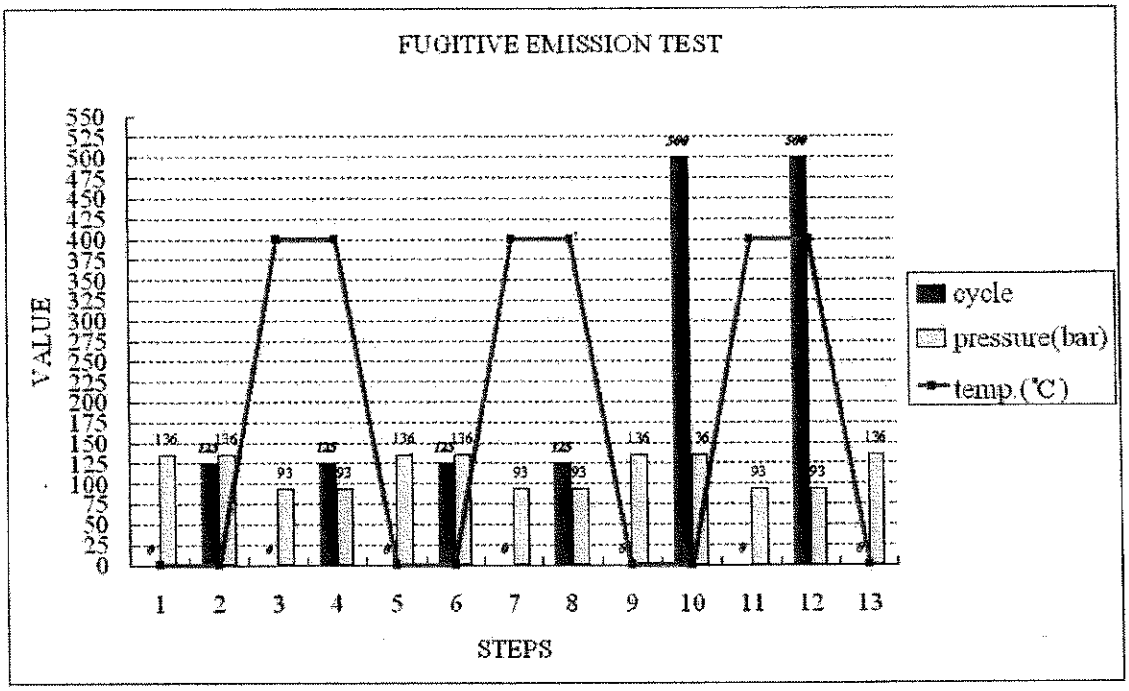
5TEST RESULTS

Test results are recorded in manufactures test report from next page.

BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE

6TEST STEPS

The below graph specifies fluctuation of the 3 factors over total of 13 test steps.



7 TEST TABLE

The following table describes total of 13 steps and leakage rates in order.

BUREAU VERITAS
REVIEWED
WITNESSED
DATE

TEST FROM ROOM TEMPERATURE(-29℃ ~+40℃) to +400℃.

Step 1. PRELIMINERY TESTS AT THE ROOM TEMPERATURE

Pres.(BAR)	Body Temp.(℃)	Body-Bonnet Leakage(PPM)	Packing leakage (atm x cm^3 x s^{-1})	**Packing torque Nm**
136	Room. Temp.	0	1.63×10^{-8}	40

Step 2. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	136	Room. Temp.	9.563×10^{-8}

Step 3. STATIC TEST AT THE SELECTED TEST TEMPERATURE 400℃

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
93	400	2.63×10^{-8}

Step 4. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 400℃

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	93	400	2.36×10^{-7}

Step 5. INTERMEIATE STATIC TESTS AT THE ROOM TEMPERATURE

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
136	Room. Temp.	4.86×10^{-7}

Step 6. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	136	Room. Temp.	8.363×10^{-7}

Step 7. STATIC TEST AT THE SELECTED TEST TEMPERATURE 400℃

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
93	400	8.363×10^{-7}

Step 8. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 400℃

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	93	400	2.78×10^{-4}

- In this point, One Packing adjustment is taken for re-tightening.

BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE 30 July 2010

Step 9. INTERMEIATE STATIC TESTS AT THE ROOM TEMPERATURE

Pres.(BAR)	Body Temp.(℃)	Packing leakage	**Packing torque Nm**
136	Room temp.	1.267×10^{-7}	39

Step 10. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
500	136	Room. Temp.	9.36×10^{-6}

Step 11. STATIC TEST AT THE SELECTED TEST TEMPERATURE 400℃

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
93	400	7.369×10^{-6}

Step 12. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 400℃

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
500	93	400	7.369×10^{-6}

Step 13. FINAL TEST AT THE ROOM TEMPERAURE

Pres.(BAR)	Body Temp.(℃)	Body-Bonnet leakage(PPM)	Packing leakage (atm x cm^3 x s^{-1})
136	Room Temp.	36	4.263×10^{-6}

POST TEST EXAMINATION

No visible damage or wear on stem packing area

BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE 05/Jul/2010

ACCEPTANCE TIGHTNESS CLASS

	CLASS B
Body & bonnet gasket seal	≤50 ppmv
Stuffing box stem seal	$\leq 10^{-4}(mgxs^{-1}xm^{-1})$ Equivalent to $\leq 1.76x10^{-6}(atm \times cm^3 \times s^{-1})$

Maximum allowable tightness leakages based on actual dimensions of stuffing box packing seals with :

- stuffing box packing seal : stem diameter 11.1 mm

	CLASS B
Stuffing box stem seal	Stem diameter 11.1 x $1.76x10^{-6}$ $(atm \times cm^3 \times s^{-1})$ = $1.9536x10^{-5}$ $(atm \times cm^3 \times s^{-1})$

Conclusion : values observed quality valve to :

TIGHTNESS CLASS : BH

With one packing adjusted**<SSA1>** for re tightening

ENDURANCE CLASS :

CO2 1,500 cycles

TEMPERAUTRE CLASS:

Room temperature to 400℃

Performance class : **ISO FE BH- CO2 – SSA1 – t- (400℃)-CL800- ISO 15848-1**

BUREAU VERITAS
REVIEWED
WITNESSED
DATE

TEST CHECKED BY :	TEST APPROVED BY :
JONG WOO , SOHN	YONG PYO, CHO
DATE: July 5TH , 2010	DATE: : July 5TH , 2010

SWI Valve Co.,Ltd

TEST/INSPECTION CERTIFICATE

DATE : 2010. 06. 11

SWI ORDER NO. : SO20100300254

1023-2, Kwanyang-Dong, Dongan-Gu, Anyang, Kyunggi-Do,
Korea. TEL : 82-31-422-7495/7 FAX : 82-31-422-7498

CERTIFICATE NO. : 1003254

CUSTOMER/CLIENT : SWI Valve co. Ltd.

PROJECT NAME / NO: Fugitive Emission Test sample

P O NO.:

NO.	ITEM DESCRIPTION	Class Press -ure	SIZE (inch)	Q'ty	Hydrostatic Test (kg/cm^2)		Air Test (kg/cm^2)	Materials(ASTM)				Dimen -sion Check	Visual Inspe -ction	Functi -onal Test	Result
					Shell	Seat / Backseat	Seat	Body & Bonnet	Seat Ring (Seat)	Stem	Wedge/ Disc (Ball)				
	GATE V/V SW	800#	1"	1	210	N.A/153	6	A105N	A276-410/HF	A276-410	A217-CA15/HF	GOOD	GOOD	GOOD	ACCEPTED

BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE 05/July/2010

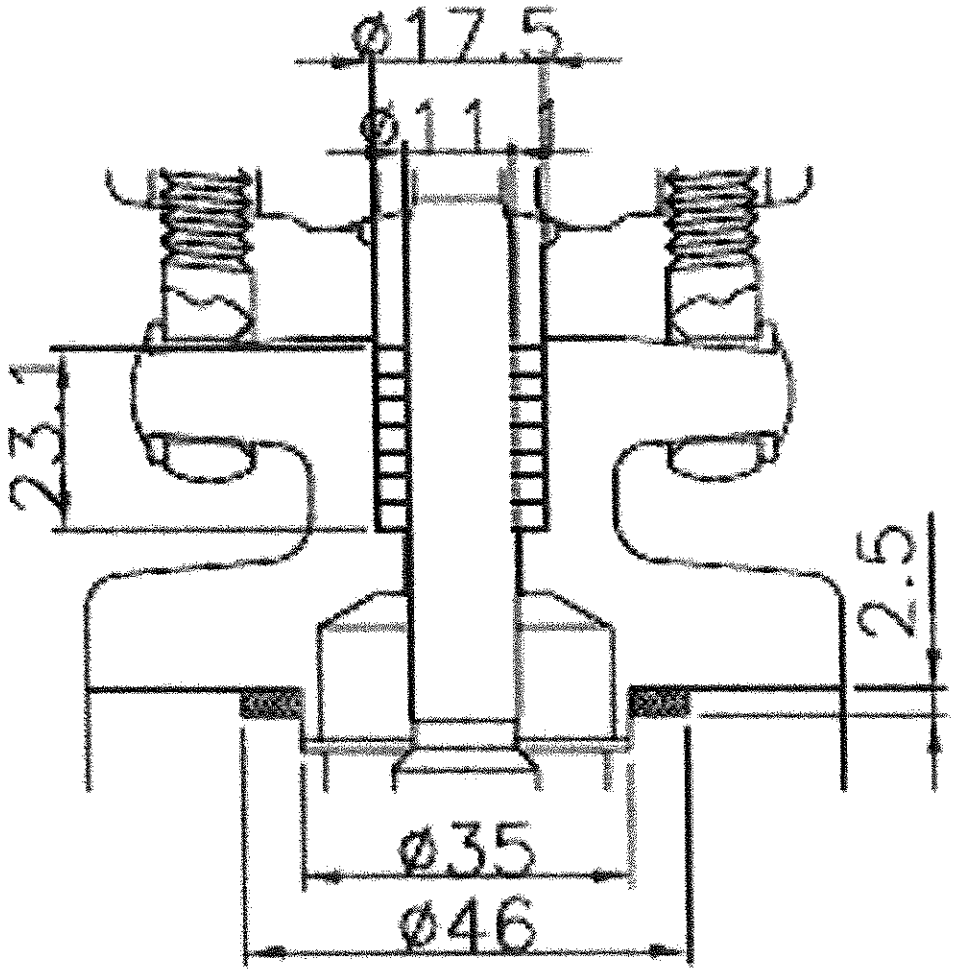
Remarks
1. These standard for inspection conform to API 598
2. HF : STELLITE NO. 6 Hard Facing.

Witnessed / Reviewed by Customer Rep.

Q.A Manager Y. P. Cho

WE HEREBY CERTIFY THAT THE RESULTS MENTIONED ABOVE ARE TRUE AND CORRECT IN EVERY DETAIL

SWI-FORM QA-013



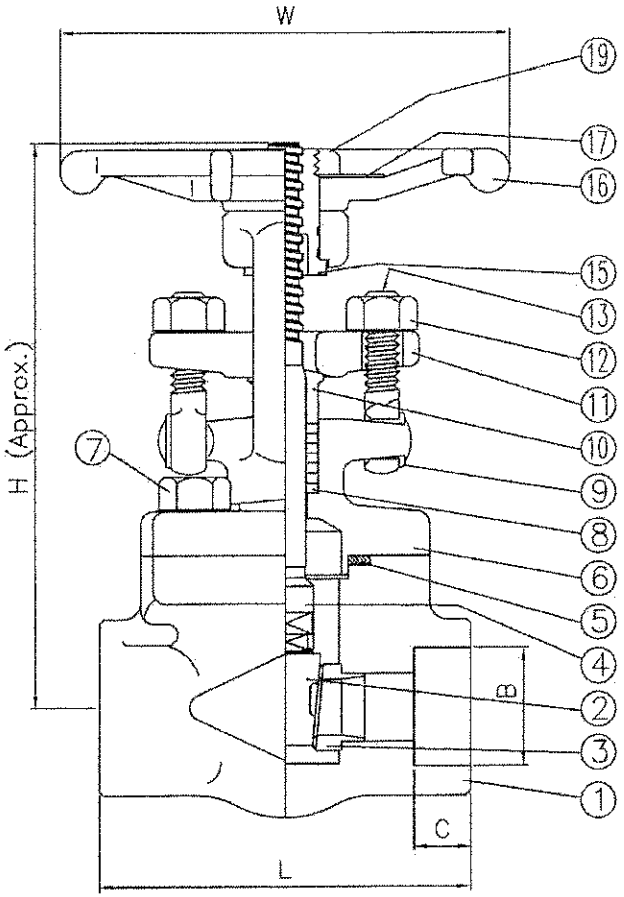
BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE

Gate

ORDER NO. :

BILL OF MATERIALS

NO.	PARTS	MATERIALS	ASTM
1	Body	Forged Steel	A105N
2	Wedge	Stainless Steel	A351-CF8M
3	Seat Ring	Stainless Steel	A276-316
4	Stem	Stainless Steel	A276-316
5	Gasket	316 Hoop + Graphite	
6	Bonnet	Forged Steel	A105N
7	Bonnet Bolt	Alloy Steel	A193-B7
8	Gland Packing	Graphite + Carbon Fiber	
9	Retaining Washer	Stainless Steel	A276-304
10	Gland	Stainless Steel	A276-316
11	Gland Flange	Forged Steel	A105
12	Gland Nut	Carbon Steel	A194-2H
13	Eye Bolt	Stainless Steel	A276-304
15	Yoke Sleeve	13Cr Stainless Steel	A276-410
16	Handwheel	Malleable Iron	A47
17	Name Plate	Aluminum	
19	Handwheel Nut	Carbon Steel	A563A



BUREAU VERITAS
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☐ WITNESSED
DATE

Hydraulic Test	Shell : 2975 Psi(210 Kg/Cm²)
	Back Seat : 2175 Psi(153 Kg/Cm²)
Pneumatic Test	Seat : 80 Psi(6 Kg/Cm²)
Seat Ring	Stellited (#6)
Wedge	Stellited (#6)
Valve Finishing	Phosphatized
End Connection	Socket Weld (ANSI B 16.11)

Rev. No.	Description	REV'D	APP'D
3			
2			
1			

SIZE (Inch)	H (Open)	L	W	Port Dia.	End Connection B	End Connection C	Weight (Kg)	Q'TY (pcs)	Valve No.
1/2	145	76	102	9.5	21.8	10	1.5		
3/4	151	86	102	12.7	27.2	13	2.0		
⇒ 1	190	102	114	18.0	33.9	13	2.8		
1-1/4	241	117	140	31.0	42.7	13	5.2		
1-1/2	241	117	140	31.0	48.8	13	5.1		
2	271	133	165	37.0	61.2	16	8.2		

TITLE FORGED STEEL GATE VALVE CLASS 800
BB OS & Y S.W REDUCED PORT

Refer to	API 602	Fig No.		D.W.G. No.	09020651-01
Drawn by	I.C.JUNG	Chk'd by	J.B.CHOI	App'd by	K.H.JUNG

CLIENT :

S W I Valve Co., Ltd.

BUREAU VERITAS

Energy & Process

TYPE APPOROVAL CERTIFICATE FOR GLOBE VALVE
No. 940013/3-CT-02

B.V. Job Ref: 3.30.1030.03

Inspection ordered to B.V. by (1) : SWI Valve Co. Ltd.
#1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Manufacturer : SWI Valve Co. Ltd., Korea

(1) the addressee of the original of this certificate ;

Description of the Supply / Subject of inspection :

Product : Forged Steel Globe Valve
Size of Tested Valve : 1"
Material of Tested Valve : ASTM A105N
Class of Tested Valve : #800
Stem Diameter : 12.7 mm
Tightness class : BH
Endurance class : CO2(1500cycles)
Temperature class : t400℃

Valves Qualified according to sizes : up to 2" (Stem Dia. : 6.35 to 25.4mm)
Valves Qualified according to pressure ratings : #150 , #300 , #600, #800
Valves Qualified according to tightness class : BH
Valves Qualified according to Endurance class : CO2(1500cycles)
Valves Qualified according to temperature class : Room temperature to 400℃

This certificate covers the whole of the supply: ☒ YES (no more inspection planned) ☐ NO (part of the supply still to be inspected)

Scope of the B.V. Survey :

- Witness for Type Test of Fugitive Emission Test

This supply complies with the following applicable document (s) : (2)

- ISO 15848-1 Industrial Valves-Measurement, Test and Qualification Procedure for Fugitive Emission

(2) and only for parts of the document(s) which concern the certification or the relevant service provided by Bureau Veritas.

List of enclosures: Test Report for Fugitive Emission Test ---------- 9 Pages

(or reference to enclosed list)
The certificate is valid together with enclosures (if listed). Only pages of enclosures (or parts of pages) which are stamped, are considered as part of this certificate.

Marking and Stamping on the items: None

Particulars or comments:
This is to certify that the following valves have been inspected by Bureau Veritas and found to be satisfactory in The Fugitive Emission Test in accordance with ISO 15848-1 Edition 2006.

Date of Issuance : 07-July-2010
Date of Inspection : 17 to 19-Jun-2010

Issued by :
Name : K. M. Kim
Sign :

Validated by :
Name : Y. M. Moon
Sign :

Location of Inspection : BV-Korea, Seoul Office

BUREAU VERITAS SEOUL 3 KOREA

This certificate is deliverered within the Scope of the General Conditions of Services of Bureau Veritas
Ce Certificat est délivré dans le cadre des Conditions Générales de Service du Bureau Veritas

This certificate is issued further to an inspection whose duration and scope were limited by the terms and conditions of the contract with BV principal. This certificate is NOT an indication that the item(s) is (are) fit for any specific purpose and does not release the manufacturer, supplier and any party from their respective duty, guarantee, obligation and/or indemnity relating to, without limitation, patents, workmanship, materials, safety, performance in operation and/or reliability.

Ad ME 9613b

PROTOTYPE TEST FOR VALVE
ACCORDING TO ISO 15848-1 Edition 2006

- Fugitive Emission Test equipment specification

1. Manufacturer : SWI VALVE CO. LTD.
2. Address : 1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea
3. Date of Test : 17th June,2010 to 19th June,2010

1 VALVE SPECIFICATION

Valve size & type	GLOBE Valve A105N/13CRFS SW 800# BB RB 1"
Material of Valve	A105N
Valve class	800#
Stem diameter	12.7 mm
Gland packing type	GRAPHITE BRAIDED PACKING + GRAPHITE MOLDED PACKING
Packing material	GRAPHITE, GRAPHITE+INCONEL WIRE
Operating torque	42 N/m
Stroke / Angle	7.8mm

2TEST CONDITION

Test pressure	136-93bar
Test medium	He 99%
Check medium	He 99%
Test temperature	RT/ 400℃
Test equipment	Fugitive emission test equip. manufactured by SWI VALVE CO. LTD.
Leakage measurement equipment	Helium Detector(ALCATEL Model ASM142 series)
Sampling method	Random
Valve repacking before test	0
Insulation of test valve	Heating Jacket used
Actuator	Geared motor

BUREAU VERITAS
REVIEWED
WITNESSED
DATE 8/July/2010

3CONDITION FOR CYCLING TEST

Number of step test cycles	4
Number of cycles for step	125
Number of step test cycles	2
Number of cycles for step	500
Number of step cycles at high temperature	3
The duration of the cycle stroke	14sec. (open 2" + stem movement 8"+ close 2")

4DOCUMENTATION USED

Industrial Valves- Measurement test and qualification procedures for fugitive emission Spec. ISO 15848-1 Edition 2006.

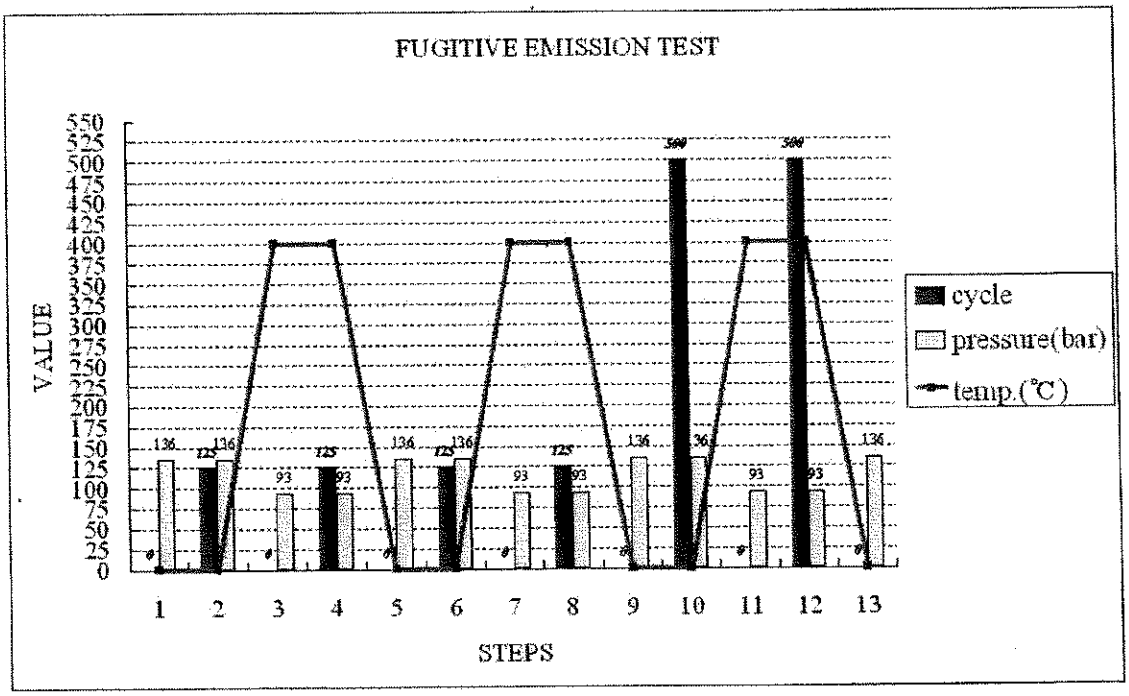
5TEST RESULTS

Test results are recorded in manufactures test report from next page.

BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE 29/July/2010

6TEST STEPS

The below graph specifies fluctuation of the 3 factors over total of 13 test steps.



7 TEST TABLE

The following table describes total of 13 steps and leakage rates in order

BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE

TEST FROM ROOM TEMPERATURE(-29℃ ~+40℃) to +400℃.

Step 1. PRELIMINERY TESTS AT THE ROOM TEMPERATURE

Pres.(BAR)(BAR)	Body Temp.(℃)(℃)	Body-Bonnet Leakage(PPM)	Packing leakage (atm x cm^3 x s^{-1})	Packing torque Nm
136	Room. Temp.	0	8.366 x10^{-7}	39

Step 2. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	136	Room. Temp.	3.34 x10^{-6}

Step 3. STATIC TEST AT THE SELECTED TEST TEMPERATURE 400℃

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
93	400	2.845×10^{-6}

Step 4. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 400℃

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	93	400	4.36×10^{-5}

Step 5. INTERMEIATE STATIC TESTS AT THE ROOM TEMPERATURE

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
136	Room. Temp.	7.261×10^{-5}

Step 6. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	136	Room. Temp.	1.236×10^{-5}

Step 7. STATIC TEST AT THE SELECTED TEST TEMPERATURE 400℃

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
93	400	2.312×10^{-6}

Step 8. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 400℃

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	93	400	9.369×10^{-5}

Step 9. INTERMEIATE STATIC TESTS AT THE ROOM TEMPERATURE

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
136	Room. Temp.	5.362×10^{-5}

BUREAU VERITAS
REVIEWED
WITNESSED
DATE

Step 10. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
500	136	Room. Temp.	3.611×10^{-2}

- In this point, One Packing adjustment is taken for re-tightening.

Step 11. STATIC TEST AT THE SELECTED TEST TEMPERATURE 400℃

Pres.(BAR)	Body Temp.(℃)	Packing leakage	Packing torque Nm
93	400	8.13×10^{-5}	39

Step 12. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 400℃

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
500	93	400	4.45×10^{-5}

Step 13. FINAL TEST AT THE ROOM TEMPERAURE

Pres.(BAR)	Body Temp.(℃)	Body-Bonnet leakage(ppm)	Packing leakage (atm x cm^3 x s^{-1})
136	Room Temp.	37	3.178×10^{-4}

POST TEST EXAMINATION

No visible damage or wear on stem packing area

BUREAU VERITAS
REVIEWED
WITNESSED
DATE

ACCEPTANCE TIGHTNESS CLASS

	CLASS B
Body & bonnet gasket seal	≤50 ppmv
Stuffing box stem seal	$\leq 10^{-4}$ (mgxs^{-1}xm^{-1}) Equivalent to $\leq 1.76 \times 10^{-6}$ (atm x cm^3 x s^{-1})

Maximum allowable tightness leakages based on actual dimensions of stuffing box packing seals with :

- stuffing box packing seal : stem diameter 12.7 mm

	CLASS B
Stuffing box stem seal	Stem diameter (12.7mm) x 1.76×10^{-6} (atm x cm^3 x s^{-1}) = 2.235×10^{-5} (atm x cm^3 x s^{-1})

Conclusion : values observed quality valve to :

TIGHTNESS CLASS : BH

With one packing adjusted≤SSA1> for re tightening

ENDURANCE CLASS :

CO2 1,500 cycles

TEMPERAUTRE CLASS:

Room temperature to 400℃

Performance class : **ISO FE BH- CO2 – SSA1 – t- (400℃)-CL800- ISO 15848-1**

BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE 05/July/2010

TEST CHECKED BY :	TEST APPROVED BY :
JONG WOO , SOHN	YONG PYO, CHO
DATE: July 5TH , 2010	DATE: : July 5TH , 2010

SWI Valve Co.,Ltd

TEST/INSPECTION CERTIFICATE

DATE : 2010. 06. 16

SWI ORDER NO. : SO20100300254

1023-2, Kwanyang-Dong, Dongan-Gu, Anyang, Kyunggi-Do,
Korea. TEL : 82-31-422-7495/7 FAX : 82-31-422-7498

CERTIFICATE NO. : 1003254

CUSTOMER/CLIENT : SWI Valve co. Ltd.

PROJECT NAME / NO: Fugitive Emission Test sample

P O NO.:

NO.	ITEM DESCRIPTION	Class Press -ure	SIZE (inch)	Q'ty	Hydrostatic Test (kg/cm^2)		Air Test (kg/cm^2)	Materials(ASTM)				Dimen -sion Check	Visual Inspe -ction	Functi -onal Test	Result
					Shell	Seat / Backseat	Seat	Body & Bonnet	Seat Ring (Seat)	Stem	Wedge/ Disc (Ball)				
	GLOBE V/V SW	800#	1"	1	210	153/153	N/A	A105N	A276-410/HF	A276-410	A217-CA15/HF	GOOD	GOOD	GOOD	ACCEPTED

BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
ID
DATE

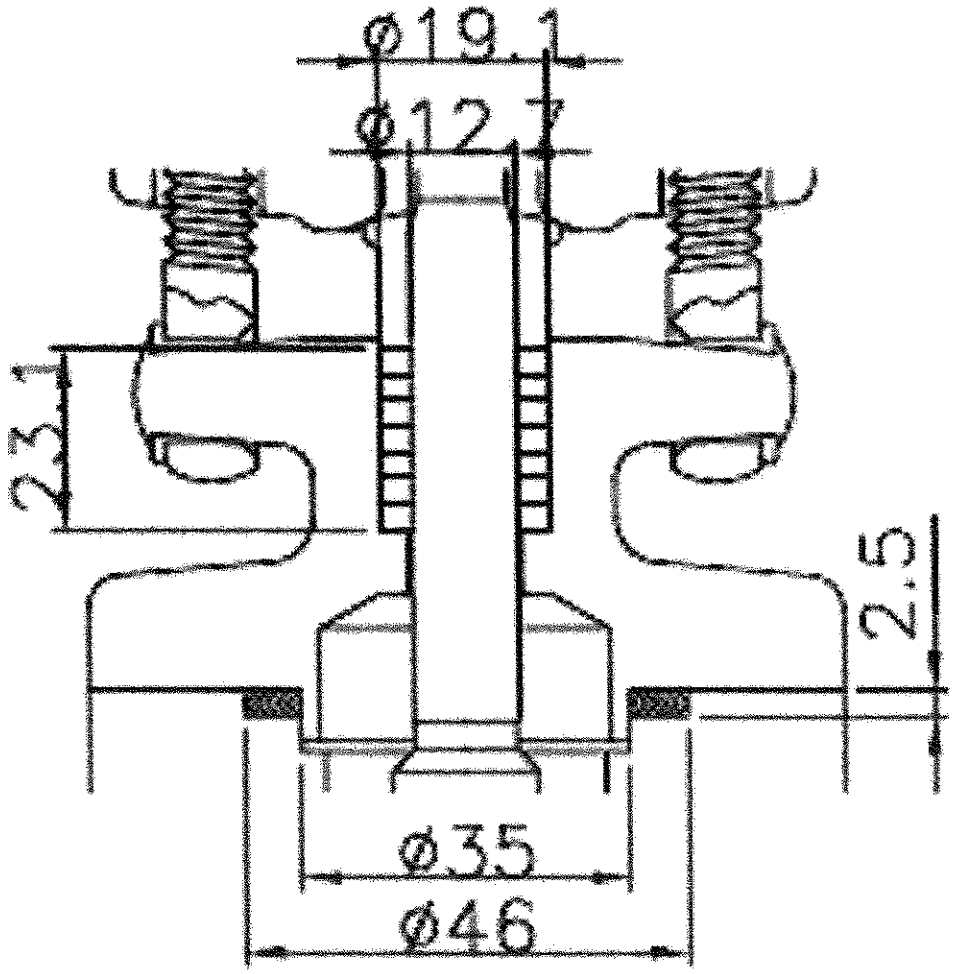
Remarks
1. These standard for inspection conform to API 598
2. HF : STELLITE NO. 6 Hard Facing.

Witnessed / Reviewed by Customer Rep.

Q.A Manager

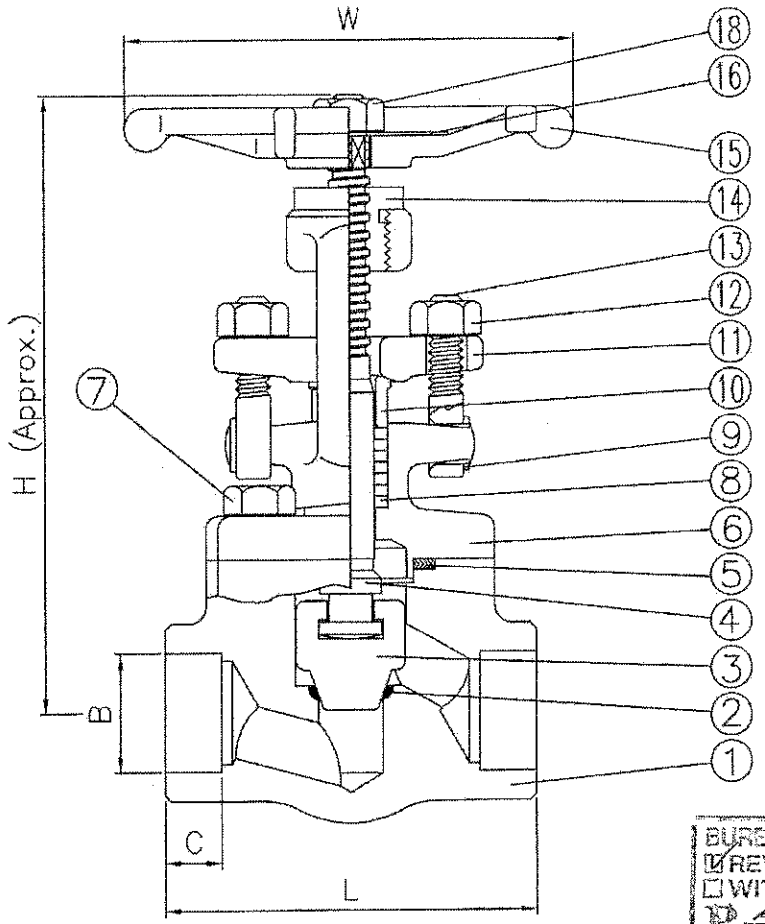
WE HEREBY CERTIFY THAT THE RESULTS MENTIONED ABOVE ARE TRUE AND CORRECT IN EVERY DETAIL

SWI-FORM QA-013



BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE

Globe



BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE

ORDER NO. :

BILL OF MATERIALS

NO.	PARTS	MATERIALS	ASTM
1	Body	Forged Steel	A105N
2	Seat	Stellite Hardfacing	
3	Disc	13Cr Stainless Steel	A217-CA15
4	Stem	13Cr Stainless Steel	A276-410
5	Gasket	304 Hoop + Graphite	
6	Bonnet	Forged Steel	A105N
7	Bonnet Bolt	Alloy steel	A193-B7
8	Gland Packing	Graphite + Carbon Fiber	
9	Ret. Washer	Stainless Steel	A276-304
10	Gland	Stainless Steel	A276-316
11	Gland Flange	Forged Steel	A105
12	Gland Nut	Carbon Steel	A194-2H
13	Eye Bolt	Stainless Steel	A276-304
14	Yoke Bush	13Cr Stainless Steel	A276-410
15	Handwheel	Malleable Iron	A47
16	Name Plate	Aluminum	
18	Handwheel Nut	Carbon Steel	A194-2H

Hydraulic Test	Shell : 2975 Psi(210 Kg/Cm^2)	
	Back Seat : 2175 Psi(153 Kg/Cm^2)	
	Seat : 2175 Psi(153 Kg/Cm^2)	
Seat of Body	Hardfaced with Stellite #6 on Body	
Disc	Stellited (#6)	
Valve Finishing	Phosphatized	
End Connection	Socket Weld (ANSI B 16.11)	

Rev. No.	Description	REV'D	APP'D
3			
2			
1			

SIZE (Inch)	H (Open)	L	W	Port Dia.	End Connection B	End Connection C	Weight (Kg)	Q'TY (pcs)	Valve No.
1/2	146	76	102	9.5	21.8	10	1.8		
3/4	152	86	102	12.7	27.2	13	2.1		
1	188	102	114	17.5	33.9	13	2.9		
1-1/4	219	152	140	22.5	42.7	13	6.4		
1-1/2	219	152	140	29.5	48.8	13	6.2		
2	260	172	165	35.0	61.2	16	9.7		

TITLE FORGED STEEL GLOBE VALVE CLASS 800
BB OS & Y S.W REDUCED PORT

Refer to	API602 / BS5352	Fig No.		D.W.G. No.	10032651-01
Drawn by	I.C.JUNG	Chk'd by	J.B.CHOI	App'd by	K.H.JUNG

CLIENT :

S W I Valve Co., Ltd.

BUREAU VERITAS

Energy & Process

TYPE APPOROVAL CERTIFICATE FOR GATE BELLOWS VALVE
No. 940013/3-CT-03

B.V. Job Ref: 3.30.1030.03

Inspection ordered to B.V. by (1) : SWI Valve Co. Ltd.
#1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Manufacturer : SWI Valve Co. Ltd., Korea

(1) the addressee of the original of this certificate ;

Description of the Supply / Subject of inspection :

Product : Forged Steel Gate bellows Valve

Size of Tested Valve : 1"
Material of Tested Valve : ASTM A105N
Class of Tested Valve : #800
Stem Diameter : 11.1 mm
Tightness class : AH
Endurance class : CO2(1500cycles)
Temperature class : t400℃

Valves Qualified according to sizes : up to 2" (Stem Dia. : 5.55 to 22.2 mm)
Valves Qualified according to pressure ratings : #150 , #300 , #600, #800
Valves Qualified according to tightness class : AH
Valves Qualified according to Endurance class : CO2(1500cycles)
Valves Qualified according to temperature class : Room temperature to +400℃

This certificate covers the whole of the supply: ☒ YES (no more inspection planned) ☐ NO (part of the supply still to be inspected)

Scope of the B.V. Survey :

- Witness for Type Test of Fugitive Emission Test

This supply complies with the following applicable document (s) : (2)

- ISO 15848-1 Industrial Valves-Measurement, Test and Qualification Procedure for Fugitive Emission

(2) and only for parts of the document(s) which concern the certification or the relevant service provided by Bureau Veritas.

List of enclosures: Test Report for Fugitive Emission Test ---------- 9 Pages

(or reference to enclosed list)
The certificate is valid together with enclosures (if listed). Only pages of enclosures (or parts of pages) which are stamped, are considered as part of this certificate.

Marking and Stamping on the items: None

Particulars or comments:
This is to certify that the following valves have been inspected by Bureau Veritas and found to be satisfactory in The Fugitive Emission Test in accordance with ISO 15848-1 Edition 2006.

Date of Issuance : 07-July-2010
Date of Inspection : 21 to 23-Jun-2010

Issued by :
Name : K. M. Kim
Sign :

Validated by :
Name : Y. M. Moon
Sign :

Location of Inspection : BV-Korea, Seoul Office

BUREAU VERITAS SEOUL 3 KOREA

This certificate is deliverered within the Scope of the General Conditions of Services of Bureau Veritas
Ce Certificat est délivré dans le cadre des Conditions Générales de Service du Bureau Veritas

This certificate is issued further to an inspection whose duration and scope were limited by the terms and conditions of the contract with BV principal. This certificate is NOT an indication that the item(s) is (are) fit for any specific purpose and does not release the manufacturer, supplier and any party from their respective duty, guarantee, obligation and/or indemnity relating to, without limitation, patents, workmanship, materials, safety, performance in operation and/or reliability.

Ad ME 9613b

PROTOTYPE TEST FOR VALVE
ACCORDING TO ISO 15848-1 Edition 2006

- Fugitive Emission Test equipment specification

1. Manufacturer : SWI VALVE CO. LTD.
2. Address : 1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea
3. Date of Test : 21ST June,2010 to 23RD June,2010

1 VALVE SPECIFICATION

Valve size & type	GATE Bellows Valve A105N/13CRFS SW 800# WB RB 1"
Material of Valve	A105N
Valve class	800#
Stem diameter	11.1 mm
Gland packing type	Graphite Braided Packing+Graphite Molded Packing Model No. : DAEWHA 6511+ 9001
Packing material	Graphite , Graphite + Inconel Wire
Operating torque	29 N/m
Stroke / Angle	24.3 mm

2TEST CONDITION

Test pressure	136-93bar
Test medium	He 99%
Check medium	He 99%
Test temperature	RT/ 400℃
Test equipment	Fugitive emission test equip. manufactured by SWI VALVE CO. LTD.
Leakage measurement equipment	Helium Detector(ALCATEL Model ASM142 series)
Sampling method	Random
Valve repacking before test	0
Insulation of test valve	Heating Jacket used
Actuator	Geared motor

BUREAU VERITAS
REVIEWED
WITNESSED
DATE

3CONDITION FOR CYCLING TEST

Number of step test cycles	4
Number of cycles for step	125
Number of step test cycles	2
Number of cycles for step	500
Number of step cycles at high temperature	3
The duration of the cycle stroke	14sec. (open 2" +stem movement 8"+close 2")

4DOCUMENTATION USED

Industrial Valves- Measurement test and qualification procedures for fugitive emission Spec. ISO 15848-1 Edition 2006.

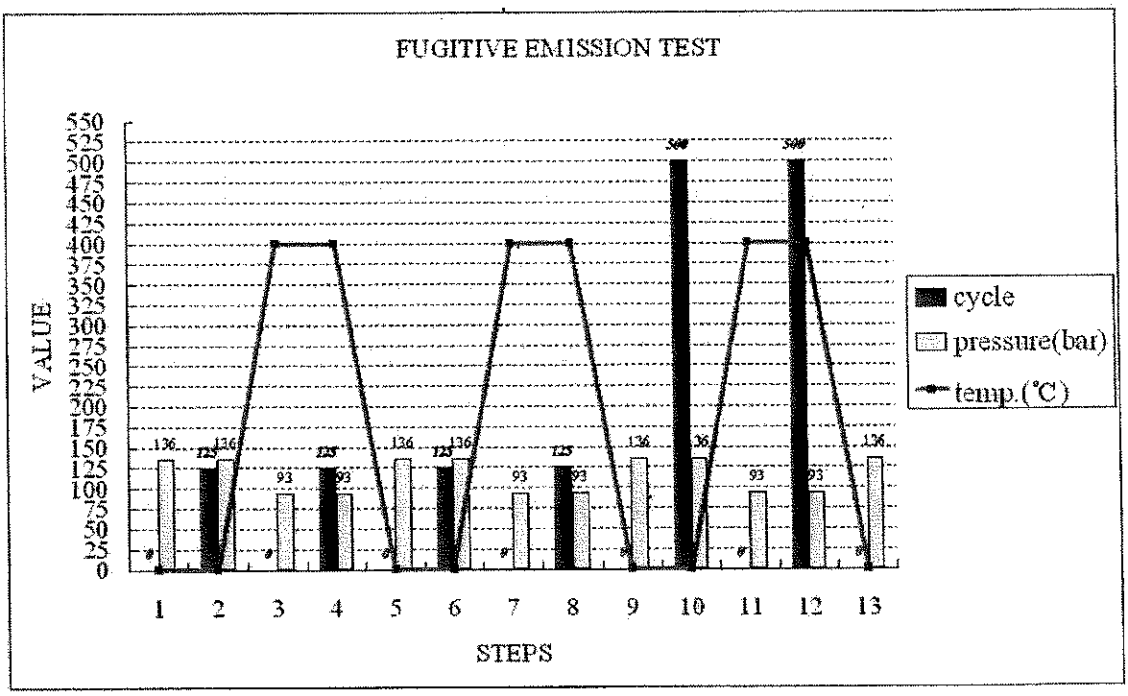
5TEST RESULTS

Test results are recorded in manufactures test report from next page.

BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE

6TEST STEPS

The below graph specifies fluctuation of the 3 factors over total of 13 test steps.



7 TEST TABLE

The following table describes total of 13 steps and leakage rates in order.

BUREAU VERITAS
REVIEWED
WITNESSED
DATE

TEST FROM ROOM TEMPERATURE(-29℃ ~+40℃) to +400℃.

Step 1. PRELIMINERY TESTS AT THE ROOM TEMPERATURE

Pres. (BAR) (BAR)	Body Temp.(℃)(℃)	Body-Bonnet Leakage(PPM)	Packing leakage (atm x cm^3 x s^{-1})	**Packing torque Nm**
136	Room. Temp.	0	6.53×10^{-12}	35

Step 2. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	136	Room. Temp.	5.36×10^{-12}

Step 3. STATIC TEST AT THE SELECTED TEST TEMPERATURE 400℃

Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
93	400	1.32×10^{-12}

Step 4. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 400℃

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	93	400	8.56×10^{-10}

Step 5. INTERMEIATE STATIC TESTS AT THE ROOM TEMPERATURE

Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
136	Room temp.	4.22×10^{-11}

Step 6. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	136	Room. Temp.	6.89×10^{-11}

Step 7. STATIC TEST AT THE SELECTED TEST TEMPERATURE 400℃

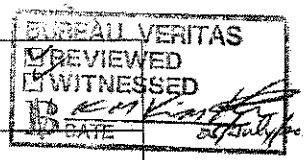
Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
93	400	8.36×10^{-11}

Step 8. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 400℃

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	93	400	3.23×10^{-10}

Step 9. INTERMEIATE STATIC TESTS AT THE ROOM TEMPERATURE

Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
136	Room. Temp.	7.26×10^{-10}



Step 10. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
500	136	Room. Temp.	1.36×10^{-9}

Step 11. STATIC TEST AT THE SELECTED TEST TEMPERATURE 400℃

Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
93	400	3.63×10^{-9}

Step 12. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 400℃

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
500	93	400	6.36×10^{-9}

Step 13. FINAL TEST AT THE ROOM TEMPERAURE

Pres. (BAR)	Body Temp.(℃)	Body-Bonnet leakage(ppm)	Packing leakage (atm x cm^3 x s^{-1})
136	Room Temp.	11	5.23×10^{-8}

POST TEST EXAMINATION

No visible damage or wear on stem packing area

BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE

ACCEPTANCE TIGHTNESS CLASS

	CLASS A
Body & bonnet gasket seal	≤50 ppmv
Stuffing box stem seal	$\leq 10^{-6}$(atm x cm^3 x s^{-1}) Equivalent to $\leq 1.76 \times 10^{-8}$(atm x cm^3 x s^{-1})

Maximum allowable tightness leakages based on actual dimensions of stuffing box packing seals with :

- stuffing box packing seal : stem diameter 11.1 mm

	CLASS A
Stuffing box stem seal	Stem diameter (11.1mm) x 1.76×10^{-8} (atm x cm^3 x s^{-1}) = 1.9536×10^{-7} (atm x cm^3 x s^{-1})

Conclusion : values observed quality valve to :

TIGHTNESS CLASS : AH

With no packing adjusted**≤SSA0>** for re tightening

ENDURANCE CLASS :

CO2 1,500 cycles

TEMPERAUTRE CLASS:

Room temperature to 400℃

Performance class : **ISO FE AH- CO2 – SSA0 – t- (400℃)-CL800- ISO 15848-1**

BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE 05/July/2010

TEST CHECKED BY :	TEST APPROVED BY :
JONG WOO , SOHN	YONG PYO, CHO
DATE: July 5TH , 2010	DATE: : July 5TH , 2010

SWI Valve Co.,Ltd

TEST/INSPECTION CERTIFICATE

DATE : 2010. 06. 19

SWI ORDER NO. : SO20100300254

1023-2, Kwanyang-Dong, Dongan-Gu, Anyang, Kyunggi-Do,
Korea. TEL : 82-31-422-7495/7 FAX : 82-31-422-7498

CERTIFICATE NO. : 1003254

CUSTOMER/CLIENT : SWI Valve co. Ltd.

PROJECT NAME / NO: Fugitive Emission Test sample

P O NO.:

NO.	ITEM DESCRIPTION	Class Press -ure	SIZE (inch)	Q'ty	Hydrostatic Test (kg/cm^2)		Air Test (kg/cm^2)	Materials(ASTM)				Dimen -sion Check	Visual Inspe -ction	Functi -onal Test	Result
					Shell	Seat / Backseat	Seat	Body & Bonnet	Seat Ring (Seat)	Stem	Wedge/ Disc (Ball)				
	GATE BELLOWS V/V SW	800#	1"	1	210	N/A	6	A105N	A276-410/HF	A276-410	A217-CA15/HF	GOOD	GOOD	GOOD	ACCEPTED

BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE

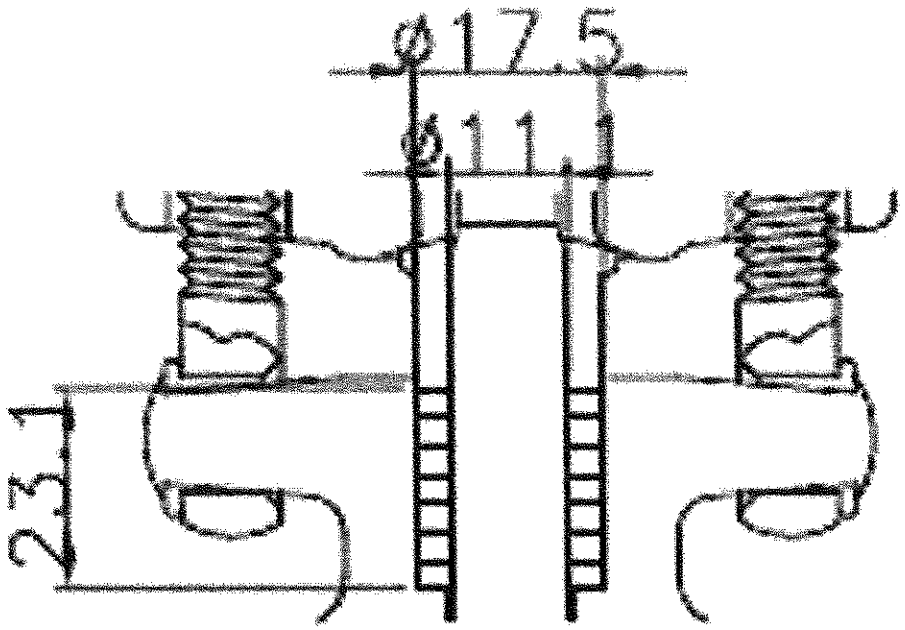
Remarks
1. These standard for inspection conform to API 598
2. HF : STELLITE NO. 6 Hard Facing.

Witnessed / Reviewed by Customer Rep.

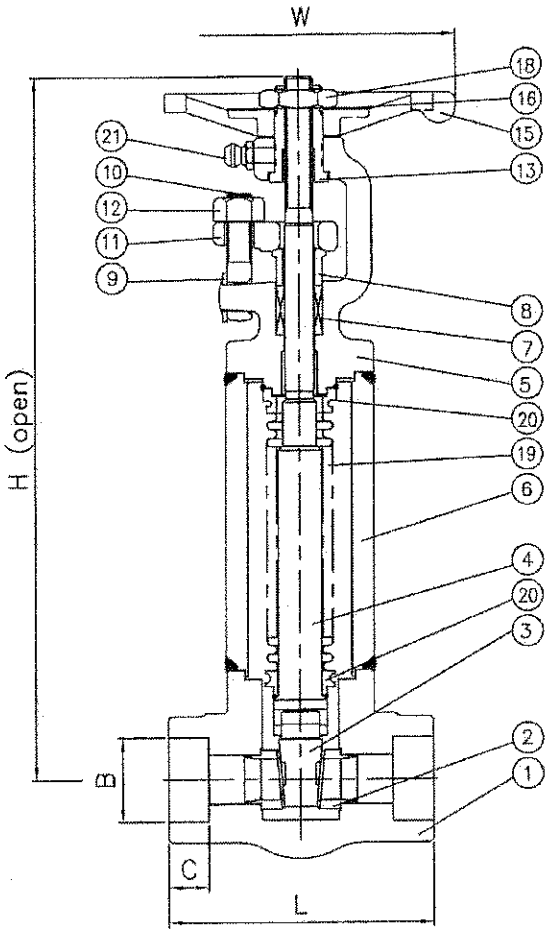
Q.A Manager

WE HEREBY CERTIFY THAT THE RESULTS MENTIONED ABOVE ARE TRUE AND CORRECT IN EVERY DETAIL

SWI-FORM QA-013



Bellows Gate



BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE

ORDER NO. :

BILL OF MATERIALS

NO.	PARTS	MATERIALS	ASTM
1	Body	Forged Steel	A105
2	Seat Ring	13Cr Stainless Steel	A276-410
3	Wedge	13Cr Stainless Steel	A743-CA40
4	Stem	13Cr Stainless Steel	A276-410
5	Bonnet	Forged Steel	A105
6	Connector	Carbon Steel	A105/A106-B
7	Gland Packing	Graphite + Carbon Fiber	
8	Gland	Stainless Steel	A276-304
9	Ret. Washer	Stainless Steel	A276-304
10	Eye Bolt	Stainless Steel	A276-304
11	Gland Flange	Forged Steel	A105
12	Gland Nut	Carbon Steel	A194-2H
13	Yoke Sleeve	13Cr Stainless Steel	
15	Handwheel	Malleable Iron	A47
16	Name Plate	Aluminum	
18	Handwheel Nut	Carbon Steel	A563A
19	Bellows	Stainless Steel	321SS
20	End Fitting	Stainless Steel	316SS
21	Grease Nipple	Carbon Steel + Cr Plated	

Hydraulic Test	Shell : 2975 Psi(209.5 Kgf/Cm^2)	
	Back Seat : 2175 Psi(153 Kgf/Cm^2)	
Pneumatic Test.	Seat : 80 Psi(6 Kgf/Cm^2)	
Seat Ring	Stellited (#6)	
Wedge	Stellited (#6)	
Valve Finishing	Phosphatized	
End Connection	Socket Weld (ANSI B 16.11)	

Rev. No.	Description	REV'D	APP'D
3			
2			
1			

SIZE (Inch)	H (Open)	L	W	Port Dia.	End Connection B	End Connection C	Weight (Kg)	Q'TY (pcs)	Valve No.
1/2	226	76	102	9.5	21.8	10	2.4		
3/4	243	86	102	12.7	27.2	13	3.1		
1	306	102	114	18.0	33.9	13	4.0		
1-1/4	395	117	140	31.0	42.7	13	8.1		
1-1/2	395	117	140	31.0	48.8	13	8.1		
2	459	133	165	37.0	61.2	16	12.9		

TITLE FORGED STEEL BELLOWS GATE VALVE
CLASS 800 WB OS & Y S.W REDUCED PORT

Refer to	API 602	Fig No.		D.W.G. No.	07112751-01
Drawn by	I.C.JUNG	Chk'd by	K.H.JUNG	App'd by	H.G.PARK

CLIENT :

S W I Valve Co., Ltd.

BUREAU VERITAS

Energy & Process

TYPE APPOROVAL CERTIFICATE FOR GLOBE BELLOWS VALVE
No. 940013/3-CT-04

B.V. Job Ref: 3.30.1030.03

Inspection ordered to B.V. by (1) : SWI Valve Co. Ltd.
#1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Manufacturer : SWI Valve Co. Ltd., Korea

(1) the addressee of the original of this certificate :

Description of the Supply / Subject of inspection :

Product : Forged Steel Globe bellows Valve
Material of Tested Valve : ASTM A105N
Size of Tested Valve : 1"
Class of Tested Valve : #800
Stem Diameter : 12.7 mm
Tightness class : AH
Endurance class : CO2(1500cycles)
Temperature class : t400℃

Valves Qualified according to sizes : up to 2" (Stem Dia. : 6.35 to 25.4mm)
Valves Qualified according to pressure ratings : #150 , #300 , #600, #800
Valves Qualified according to tightness class : AH
Valves Qualified according to Endurance class : CO2(1500cycles)
Valves Qualified according to temperature class : Room temperature to +400℃

This certificate covers the whole of the supply: ☒ YES (no more inspection planned) ☐ NO (part of the supply still to be inspected)

Scope of the B.V. Survey :

- Witness for Type Test of Fugitive Emission Test

This supply complies with the following applicable document (s) : (2)

- ISO 15848-1 Industrial Valves-Measurement, Test and Qualification Procedure for Fugitive Emission

(2) and only for parts of the document(s) which concern the certification or the relevant service provided by Bureau Veritas.

List of enclosures: Test Report for Fugitive Emission Test ---------- 9 Pages

(or reference to enclosed list)
The certificate is valid together with enclosures (if listed). Only pages of enclosures (or parts of pages) which are stamped, are considered as part of this certificate.

Marking and Stamping on the items: **None**

Particulars or comments:
This is to certify that the following valves have been inspected by Bureau Veritas and found to be satisfactory in The Fugitive Emission Test in accordance with ISO 15848-1 Edition 2006.

Date of Issuance : 07-July-2010
Date of Inspection : 24 to 26-Jun-2010

Issued by :
Name : K. M. Kim
Sign :

Validated by :
Name : Y. M. Moon
Sign :

Location of Inspection : BV-Korea, Seoul Office

BUREAU VERITAS SEOUL 3 KOREA

This certificate is issued further to an inspection whose duration and scope were limited by the terms and conditions of the contract with BV principal. This certificate is NOT an indication that the item(s) is (are) fit for any specific purpose and does not release the manufacturer, supplier and any party from their respective duty, guarantee, obligation and/or indemnity relating to, without limitation, patents, workmanship, materials, safety, performance in operation and/or reliability.

PROTOTYPE TEST FOR VALVE
ACCORDING TO ISO 15848-1 Edition 2006

- Fugitive Emission Test equipment specification

1. Manufacturer : SWI VALVE CO. LTD.
2. Address : 1023-2 Gwanyang 1-dong,Dongan-gu,
   Anyang-si, Gyeonggi-do, Korea
3. Date of Test : 24th June,2010 to 26th June,2010

1 VALVE SPECIFICATION

Valve size & type	GLOBE Bellows Valve A105N/13CRFS SW 800# WB RB 1"
Material of Valve	A105N
Valve class	800#
Stem diameter	12.7 mm
Gland packing type	Graphite Braided Packing+Graphite Molded Packing Model No. : DAEWHA 6511+ 9001
Packing material	Graphite , Graphite + Inconel Wire
Operating torque	32 N/m
Stroke / Angle	7.8mm

2TEST CONDITION

Test pressure	136-93bar
Test medium	He 99%
Check medium	He 99%
Test temperature	RT/ 400℃
Test equipment	Fugitive emission test equip. manufactured by SWI VALVE CO. LTD.
Leakage measurement equipment	Helium Detector(ALCATEL Model ASM142 series)
Sampling method	Random
Valve repacking before test	0
Insulation of test valve	Heating Jacket used
Actuator	Geared motor

BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE

3CONDITION FOR CYCLING TEST

Number of step test cycles	4
Number of cycles for step	125
Number of step test cycles	2
Number of cycles for step	500
Number of step cycles at high temperature	3
The duration of the cycle stroke	14sec. (open 2" +stem movement 8"+close 2")

4DOCUMENTATION USED

Industrial Valves- Measurement test and qualification procedures for fugitive emission Spec. ISO 15848-1 Edition 2006.

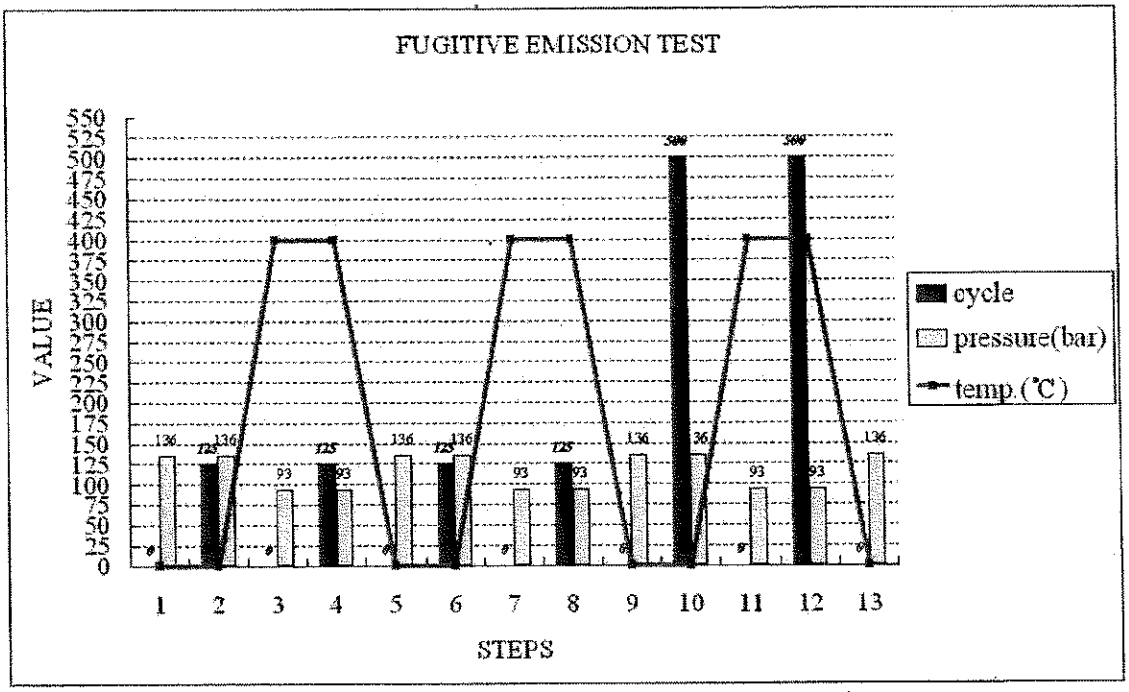
5TEST RESULTS

Test results are recorded in manufactures test report from next page.

BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE

6 TEST STEPS

The below graph specifies fluctuation of the 3 factors over total of 13 test steps.



7 TEST TABLE

The following table describes total of 13 steps and leakage rates in order.

BUREAU VERITAS
REVIEWED
WITNESSED
DATE

TEST FROM ROOM TEMPERATURE(-29℃ ~+40℃) to +400℃.

Step1.PRELIMINERY TESTS AT THE ROOM TEMPERATURE

Pres.(BAR)	Body Temp.(℃)	Body-Bonnet Leakage(PPM)	Packing leakage (atm x cm^3 x s^{-1})	**Packing torque (Nm)**
136	Room. Temp.	0	5.36×10^{-12}	37

Step2.MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres.	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	136	Room. Temp.	8.36×10^{-11}

Step3.STATIC TEST AT THE SELECTED TEST TEMPERATURE 400℃

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
93	400	4.36 $x10^{-12}$

Step4.MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 400℃

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	93	400	5.63 $x10^{-11}$

Step5.INTERMEIATE STATIC TESTS AT THE ROOM TEMPERATURE

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
136	Room. Temp.	4.59 $x10^{-11}$

Step6.MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	136	Room. Temp.	9.62 $x10^{-11}$

Step7.STATIC TEST AT THE SELECTED TEST TEMPERATURE 400℃

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
93	400	8.36 $x10^{-11}$

Step8.MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 400℃

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	93	400	7.36 $x10^{-10}$

Step9.INTERMEIATE STATIC TESTS AT THE ROOM TEMPERATURE

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
136	Room. Temp.	1.25 $x10^{-11}$

BUREAU VERITAS
REVIEWED
WITNESSED
DATE

Step10.MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
500	136	Room. Temp.	6.82 x10^{-10}

Step11.STATIC TEST AT THE SELECTED TEST TEMPERATURE 400℃

Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
93	400	7.28 x10^{-10}

Step12.MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 400℃

No. of Cycles	Pres.(BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
500	93	400	9.25 x10^{-9}

Step13.FINAL TEST AT THE ROOM TEMPERAURE

Pres.(BAR)	Body Temp.(℃)	Body-Bonnet leakage(ppm)	Packing leakage (atm x cm^3 x s^{-1})
136	Room Temp.	12	1.23 x10^{-9}

POST TEST EXAMINATION

No visible damage or wear on stem packing area

BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE 5/July/2010

ACCEPTANCE TIGHTNESS CLASS

	CLASS A
Body & bonnet gasket seal	≤50 ppmv
Stuffing box stem seal	$\leq 10^{-6}$(mg x s^{-1} x m^{-1}) Equivalent to $\leq 1.76 \times 10^{-8}$(atm x cm^3 x s^{-1})

Maximum allowable tightness leakages based on actual dimensions of stuffing box packing seals with :

- stuffing box packing seal : stem diameter 12.7 mm

	CLASS A
Stuffing box stem seal	Stem diameter (12.7mm) x 1.76×10^{-8} (atm x cm^3 x s^{-1}) = 2.235×10^{-7} (atm x cm^3 x s^{-1})

Conclusion : values observed quality valve to :

TIGHTNESS CLASS : AH

With no packing adjusted **≤SSA0>**for re tightening

ENDURANCE CLASS :

CO2 1,500 cycles

TEMPERAUTRE CLASS:

Room temperature to 400℃

Performance class : **ISO FE AH- CO2 – SSA0 – t- (400℃)-CL800- ISO 15848-1**

BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE

TEST CHECKED BY :	TEST APPROVED BY :
JONG WOO , SOHN	YONG PYO, CHO
DATE: July 5TH , 2010	DATE: : July 5TH , 2010

SWI Valve Co.,Ltd

TEST/INSPECTION CERTIFICATE

DATE : 2010. 06. 23

SWI ORDER NO. : SO20100300254

1023-2, Kwanyang-Dong, Dongan-Gu, Anyang, Kyunggi-Do,
Korea. TEL : 82-31-422-7495/7 FAX : 82-31-422-7498

CERTIFICATE NO. : 1003254

CUSTOMER/CLIENT : SWI Valve co. Ltd.

PROJECT NAME / NO: Fugitive Emission Test sample

P O NO.:

NO.	ITEM DESCRIPTION	Class Press -ure	SIZE (inch)	Q'ty	Hydrostatic Test (kg/cm^2)		Air Test (kg/cm^2)	Materials(ASTM)				Dimen -sion Check	Visual Inspe -ction	Functi -onal Test	Result
					Shell	Seat / Backseat	Seat	Body & Bonnet	Seat Ring (Seat)	Stem	Wedge/ Disc (Ball)				
	GLOBE BELLOWS V/V SW	800#	1"	1	210	153/N.A	N/A	A105N	A276-410/HF	A276-410	A217-CA15/HF	GOOD	GOOD	GOOD	ACCEPTED

BUREAU VERITAS
REVIEWED
WITNESSED
DATE

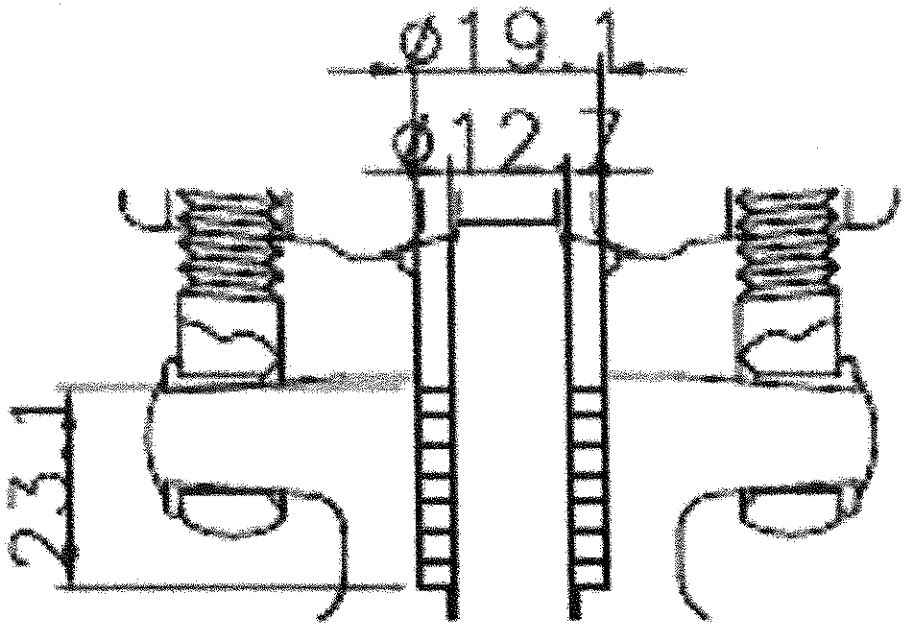
Remarks
1. These standard for inspection conform to API 598
2. HF : STELLITE NO. 6 Hard Facing.

Witnessed / Reviewed by Customer Rep.

Q.A Manager

WE HEREBY CERTIFY THAT THE RESULTS MENTIONED ABOVE ARE TRUE AND CORRECT IN EVERY DETAIL

SWI-FORM QA-013



Bellows Globe

ORDER NO. :

BILL OF MATERIALS

NO.	PARTS	MATERIALS	ASTM
1	Body	Forged Steel	A105
2	Seat	Stellite Hardfacing	
3	Disc	13Cr Stainless Steel	A276-410
4	Stem	13Cr Stainless Steel	A276-410
5	Bonnet	Forged Steel	A105
6	Connector	Carbon Steel	A105/A106-B
7	Gland Packing	Graphite + Carbon Fiber	
8	Gland	Stainless Steel	A276-304
9	Ret. Washer	Stainless Steel	A276-304
10	Eye Bolt	Stainless Steel	A276-304
11	Gland Flange	Forged Steel	A105
12	Gland Nut	Carbon Steel	A194-2H
13	Yoke Sleeve	13Cr Stainless Steel	A276-410
15	Handwheel	Malleable Iron	A47
16	Name Plate	Stainless Plate	A240-304
18	Handwheel Nut	Carbon Steel	A563A
19	Bellows	Stainless Steel	321SS
20	Guide Pin	13Cr Stainless Steel	A276-410
21	Grease Nipple	Carbon Steel + Cr Plated	

Hydraulic Test	Shell : 2975 Psi(210 Kg/Cm^2)
	Back Seat : 2175 Psi(153 Kg/Cm^2)
	Seat : 2175 Psi(153 Kg/Cm^2)
Seat of Body	Hardfaced with Stellite #6 on Body
Disc	Stellited (#6)
Valve Finishing	Phosphatized
End Connection	Socket Weld (ANSI B16.11)

Rev. No.	Description	REV'D	APP'D
3			
2			
1			

BUREAU VERITAS
☐ REVIEWED
☐ WITNESSED
DATE

SIZE (Inch)	H (Open)	L	W	Port Dia.	End Connection B	End Connection C	Weight (Kg)	Q'TY (pcs)	Tag No.
1/2	202	76	102	9.5	21.8	10	2.1	17	
3/4	202	86	102	12.7	27.2	13	2.6	5	
1	233	102	114	17.5	33.9	13	3.4	88	
1-1/2	269	152	140	29.5	48.8	13	7.0	3	
2	351	172	165	35.0	61.2	16	11.7	43	

TITLE: FORGED STEEL BELLOWS GLOBE VALVE
CLASS 800 WB OS & Y S.W REDUCED PORT

Refer to	API 602 / BS5352	Fig No.		D.W.G. No.	04033053-01
Drawn by	J.E.PARK	Chk'd by	K.H.JUNG	App'd by	H.G.PARK

CLIENT :

S W I Valve Co., Ltd.

BUREAU VERITAS

Energy & Process

TYPE APPOROVAL CERTIFICATE FOR 2-P TRUNNION BALL VALVE
No. 940013/3-CT-05

B.V. Job Ref: 3.30.1030.03

Inspection ordered to B.V. by (1) : SWI Valve Co. Ltd.
#1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Manufacturer : SWI Valve Co. Ltd., Korea

(1) the addressee of the original of this certificate ;

Description of the Supply / Subject of inspection :

Product :Cast Steel 2-P Trunnion Ball Valve
Material of Tested Valve : ASTM A216-WCB
Size of Tested Valve : 4"
Class of Tested Valve : #600
Stem Diameter : 36.0 mm
Tightness class : AH
Endurance class : CO2(1500cycles)
Temperature class : t200℃

Valves Qualified according to sizes : up to 16" (Stem Dia. : 18 to 72mm)
Valves Qualified according to pressure ratings : #150 , #300 , #600
Valves Qualified according to tightness class : AH
Valves Qualified according to Endurance class : CO2(1500cycles)
Valves Qualified according to temperature class : Room temperature to + 200℃

This certificate covers the whole of the supply: ☒ YES (no more inspection planned) ☐ NO (part of the supply still to be inspected)

Scope of the B.V. Survey :

- Witness for Type Test of Fugitive Emission Test

This supply complies with the following applicable document (s) : (2)

- ISO 15848-1 Industrial Valves-Measurement, Test and Qualification Procedure for Fugitive Emission

(2) and only for parts of the document(s) which concern the certification or the relevant service provided by Bureau Veritas.

List of enclosures: Test Report for Fugitive Emission Test ---------- 10 Pages

(or reference to enclosed list)
The certificate is valid together with enclosures (if listed). Only pages of enclosures (or parts of pages) which are stamped, are considered as part of this certificate.

Marking and Stamping on the items: **None**

Particulars or comments:
This is to certify that the following valves have been inspected by Bureau Veritas and found to be satisfactory in The Fugitive Emission Test in accordance with ISO 15848-1 Edition 2006.

Date of Issuance : 07-July-2010
Date of Inspection : 28 to 30-Jun-2010

Issued by :
Name : K. M. Kim
Sign :

Validated by :
Name : Y. M. Moon
Sign :

Location of Inspection : BV-Korea, Seoul Office

BUREAU VERITAS SEOUL 3 KOREA

This certificate is delivererd within the Scope of the General Conditions of Services of Bureau Veritas
Ce Certificat est délivré dans le cadre des Conditions Générales de Service du Bureau Veritas

This certificate is issued further to an inspection whose duration and scope were limited by the terms and conditions of the contract with BV principal. This certificate is NOT an indication that the item(s) is (are) fit for any specific purpose and does not release the manufacturer, supplier and any party from their respective duty, guarantee, obligation and/or indemnity relating to, without limitation, patents, workmanship, materials, safety, performance in operation and/or reliability.	

Ad ME 9613b

PROTOTYPE TEST FOR VALVE
ACCORDING TO ISO 15848-1 Edition 2006

- Fugitive Emission Test equipment specification

1. Manufacturer : SWI VALVE CO. LTD.
2. Address : 1023-2 Gwanyang 1-dong,Dongan-gu,
   Anyang-si, Gyeonggi-do, Korea
3. Date of Test : 28th June,2010 to 30th June,2010

1 VALVE SPECIFICATION

Valve size & type	2P-TRUNNION BALL VALVE WCB/316+RTFE RF FB 600# 4"
Material of Valve	A216-WCB
Valve class	600#
Stem diameter	36.0 mm
Gland packing type	Graphite Molded Packing
Packing material	FKM+Graphite
Operating torque	396 N/m
Stroke/ Angle	Quarter-turn

2TEST CONDITION

Test pressure	102-88 bar
Test medium	He 99%
Check medium	He 99%
Test temperature	RT/ 200℃
Test equipment	Fugitive emission test equip. manufactured by SWI VALVE CO. LTD.
Leakage measurement equipment	Helium Detector(ALCATEL Model ASM142 series)
Sampling method	Random
Valve repacking before test	0
Insulation of test valve	Heating Jacket used
Actuator	Geared motor

BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE

3CONDITION FOR CYCLING TEST

Number of step test cycles	4
Number of cycles for step	125
Number of step test cycles	2
Number of cycles for step	500
Number of step cycles at high temperature	3
The duration of the cycle stroke	14sec. (open 2sec. +stem movement 8sec.+close 2sec.)

4DOCUMENTATION USED

Industrial Valves- Measurement test and qualification procedures for fugitive emission Spec. ISO 15848-1 Edition 2006.

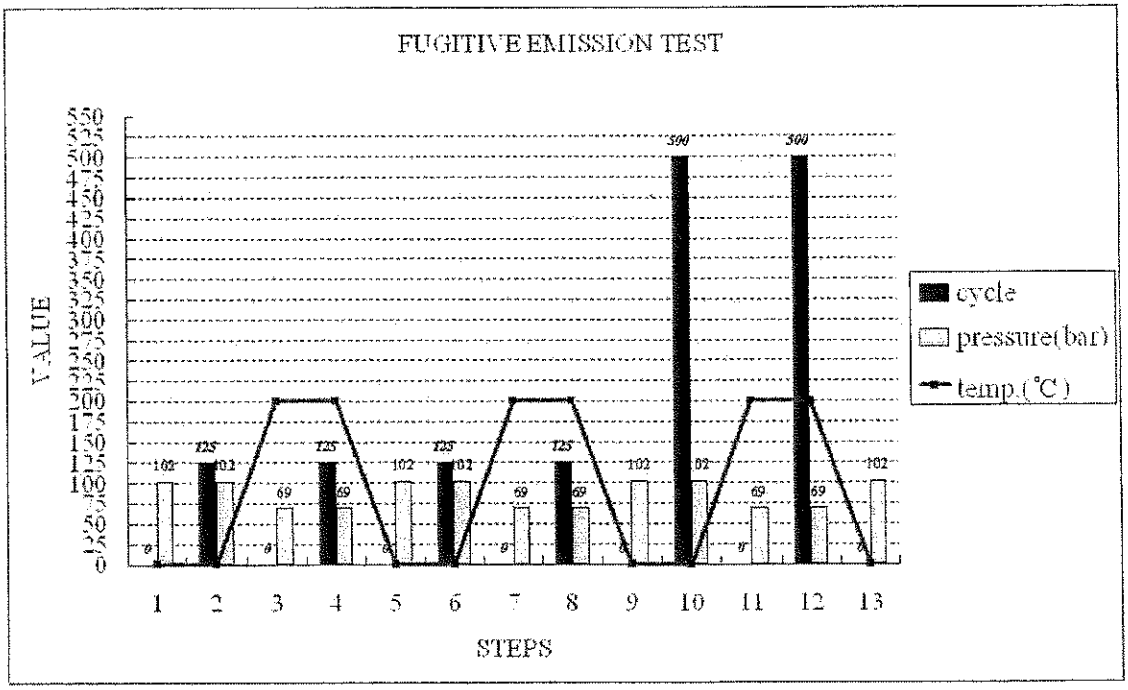
5TEST RESULTS

Test results are recorded in manufactures test report from next page.

BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE

6TEST STEPS

The below graph specifies fluctuation of the 3 factors over total of 13 test steps.



7 TEST TABLE

The following table describes total of 13 steps and leakage rates in order.

BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE

TEST FROM ROOM TEMPERATURE TO +200℃

Step 1. PRELIMINERY TESTS AT THE ROOM TEMPERATURE

Pres. (BAR)	Body Temp.(℃)	Body-Bonnet Leakage(PPM)	Packing leakage (atm x cm^3 x s^{-1})	**Packing torque Nm**
102	Room. Temp.	0	5.125×10^{-12}	53

Step 2. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	102	Room. Temp.	4.336×10^{-11}

Step 3. STATIC TEST AT THE SELECTED TEST TEMPERATURE 200℃

Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
88	200	4.216×10^{-11}

Step 4. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 200℃

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	69	200	3.21×10^{-10}

Step 5. INTERMEIATE STATIC TESTS AT THE ROOM TEMPERATURE

Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
102	Room. Temp.	4.23×10^{-11}

Step 6. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	102	Room. Temp.	2.156×10^{-11}

Step 7. STATIC TEST AT THE SELECTED TEST TEMPERATURE 200℃

Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
88	200	9.53×10^{-11}

Step 8. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 200℃

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
125	69	200	6.23×10^{-10}

Step 9. INTERMEIATE STATIC TESTS AT THE ROOM TEMPERATURE

Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
102	Room. Temp.	5.112×10^{-11}

BUREAU VERITAS
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DATE

Step 10. MECHANICAL CYCLE TEST AT THE ROOM TEMPERATURE

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage ((atm x cm^3 x s^{-1})
500	102	Room. Temp.	8.42×10^{-9}

Step 11. STATIC TEST AT THE SELECTED TEST TEMPERATURE 200℃

Pres. (BAR)	Body Temp.(℃)	Packing leakage(atm x cm^3 x s^{-1})
88	200	6.65×10^{-10}

Step 12. MECHANICAL CYCLE TEST AT THE SELECTED TEST TEMPERATURE 200℃

No. of Cycles	Pres. (BAR)	Body Temp.(℃)	Packing leakage (atm x cm^3 x s^{-1})
500	69	200	4.23×10^{-9}

Step 13. FINAL TEST AT THE ROOM TEMPERAURE

Pres. (BAR)	Body Temp.(℃)	Body-Bonnet leakage(PPM)	Packing leakage (atm x cm^3 x s^{-1})
102	Room Temp.	15	4.35×10^{-9}

POST TEST EXAMINATION

No visible damage and wear on stem packing area

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ACCEPTANCE TIGHTNESS CLASS

	CLASS A
Body & bonnet gasket seal	≤50 ppmv
Stuffing box stem seal	$\leq 10^{-6}(mg x s^{-1} x m^{-1})$ Equivalent to $\leq 1.76 x 10^{-6}(atm \times cm^3 \times s^{-1})$

Maximum allowable tightness leakages based on actual dimensions of stuffing box packing seals with :

- stuffing box packing seal : stem diameter 36.0 mm

	CLASS A
Stuffing box stem seal	Stem diameter(36.0mm)x1.76x 10^{-8} $(atm \times cm^3 \times s^{-1})$ = $6.336 x 10^{-7}$ $(atm \times cm^3 \times s^{-1})$

Conclusion : values observed quality valve to :

TIGHTNESS CLASS : AH

With no packing adjusted**≤SSA0>** for re tightening

ENDURANCE CLASS :

CO2 1,500 cycles

TEMPERAUTRE CLASS:

Room temperature to 200℃

BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE

Performance class : **ISO FE AH- CO2 – SSA0 – t- (200℃)-CL600- ISO 15848-1**

TEST CHECKED BY :	TEST APPROVED BY :
JONG WOO , SOHN	YONG PYO, CHO
DATE: July 5TH , 2010	DATE: : July 5TH , 2010

SWI Valve Co.,Ltd

TEST/INSPECTION CERTIFICATE

DATE : 2010. 06. 26

SWI ORDER NO. : SO20100300254

1023-2, Kwanyang-Dong, Dongan-Gu, Anyang, Kyunggi-Do,
Korea. TEL : 82-31-422-7495/7 FAX : 82-31-422-7498

CERTIFICATE NO. : 1003254

CUSTOMER/CLIENT : SWI Valve co. Ltd.

PROJECT NAME / NO: Fugitive Emission Test sample

P O NO.:

NO.	ITEM DESCRIPTION	Class Press -ure	SIZE (inch)	Q'ty	Hydrostatic Test (kg/cm^2)		Air Test (kg/cm^2)	Materials(ASTM)				Dimen -sion Check	Visual Inspe -ction	Functi -onal Test	Result
					Shell	Seat / Backseat	Seat	Body & Bonnet	Seat Ring (Seat)	Stem	Wedge/ Disc (Ball)				
	2-P TRUNNION BALL V/V RF	600#	4"	1	157	N/A	7	A216-WCB	RTFE	A276-316	A276-316	GOOD	GOOD	GOOD	ACCEPTED

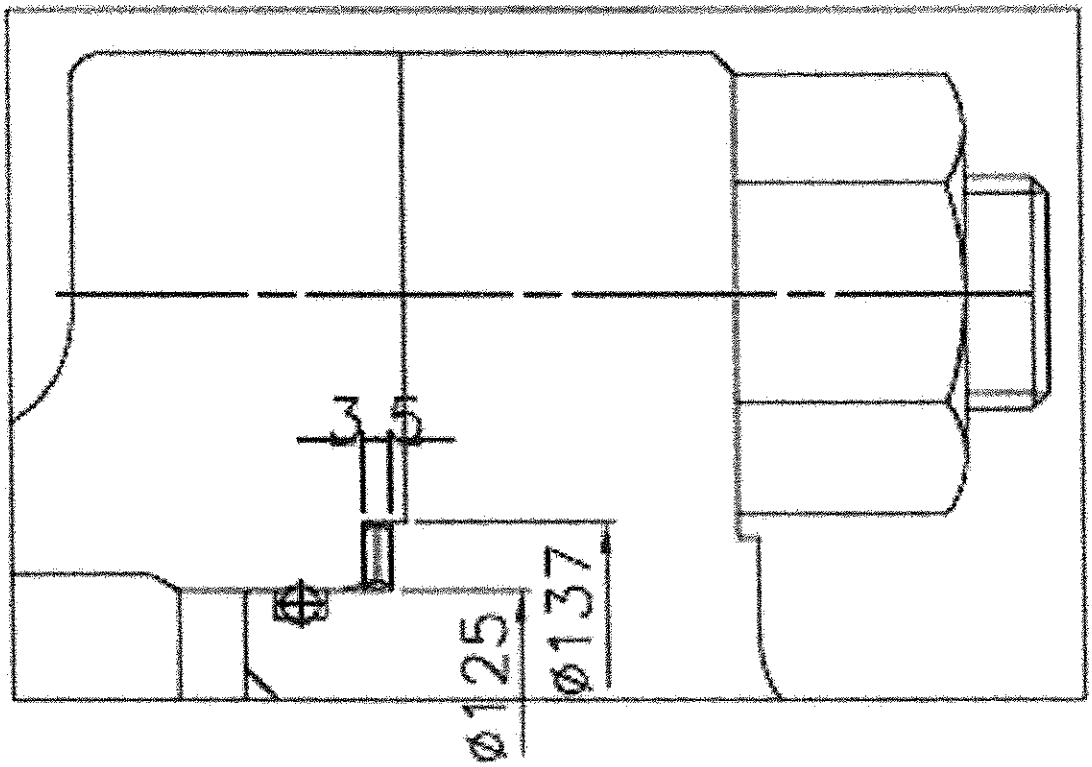
BUREAU VERITAS
REVIEWED
WITNESSED
DATE 05/30/2010

Remarks
1. These standard for inspection conform to API 598
2. HF : STELLITE NO. 6 Hard Facing.

Witnessed / Reviewed by Customer Rep.

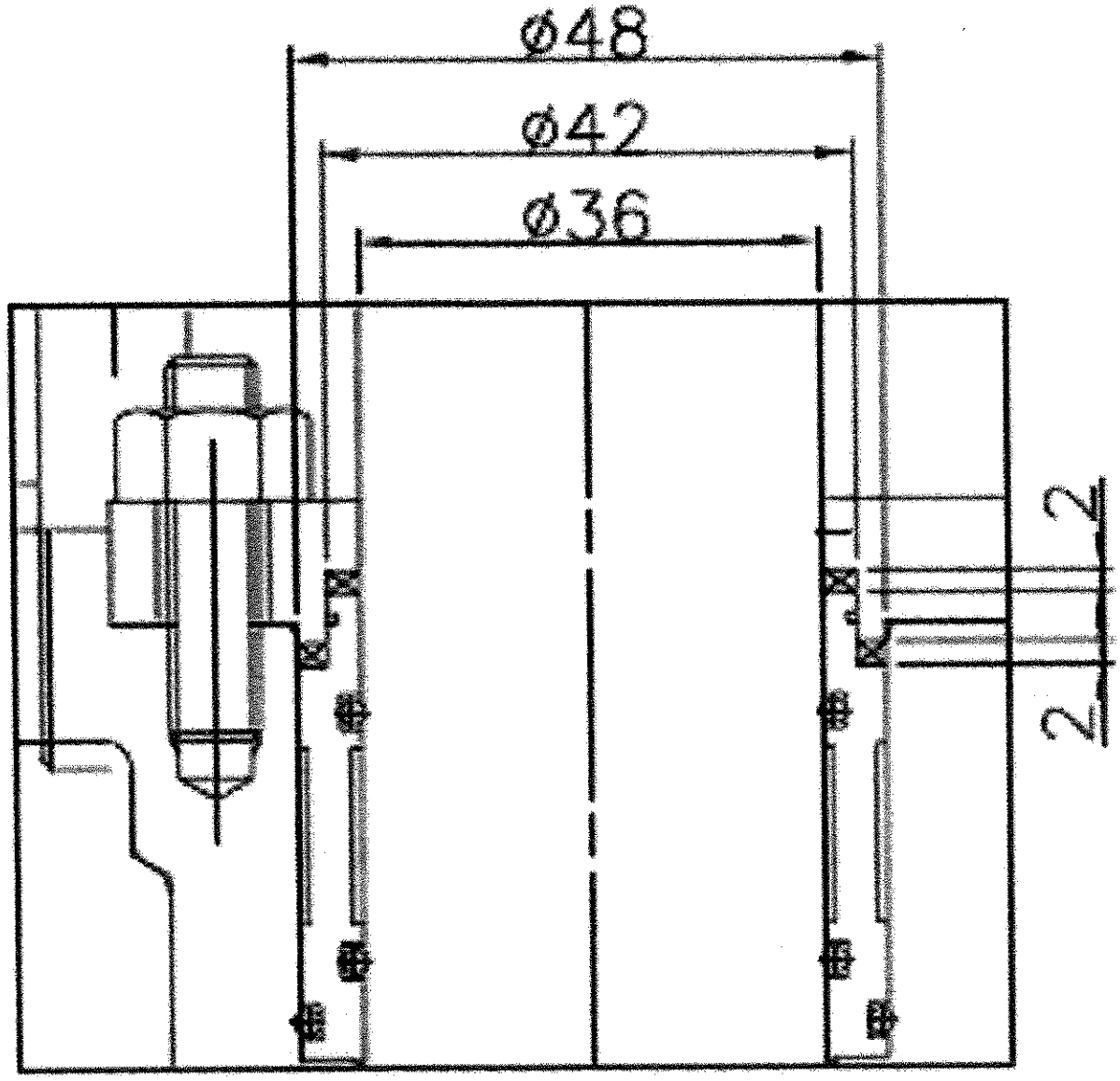
Q.A Manager

WE HEREBY CERTIFY THAT THE RESULTS MENTIONED ABOVE ARE TRUE AND CORRECT IN EVERY DETAIL



Ball Valve Gasket Area

BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE 03/July/2010



Ball Valve Packing Area

ORDER NO. :

BILL OF MATERIALS

NO	DESCRIPTIONS	MATERIAL	REMARK
10	BODY	A216-WCB	
20	CAP	A216-WCB	
21	CAP GASKET	316SPW + GRAPHITE	
22	CAP O-RING	VITON (AED)	
23	CAP BOLT	A193-B7M	
24	CAP NUT	A194-2HM	
30	BALL	A351-CF8M	
40	SEAT	RTFE	
41	SEAT HOLDER	A276-316/A351-CF8M	
42	SEAT SPRING	INCONEL X-750	
43	SEAT O-RING	VITON (AED)	
47	ENERGIZER	A276-316	
48	SEAT FIRE SAFE SEAL	GRAPHITE	
49	SPACER	PTFE	
50	STEM	A276-316	
51	THRUST WASHER	316SS + PTFE	
52	STEM DRY BEARING	316SS + PTFE	
53	STEM BUSHING	A276-316	
54	BUSH INNER O-RING	VITON (AED)	
55	BUSH OUTER O-RING	VITON (AED)	
60	TRUNNION	A276-316	
61	TRUNNION COVER	A105	
63	TRUNNION DRY BEARING	316SS + PTFE	
64	COVER GASKET	316SPW + GRAPHITE	
65	COVER O-RING	VITON (AED)	
66	COVER BOLT	A193-B7M	
67	COVER NUT	A194-2HM	
70a	STEM COVER FIRE SAFE SEAL	GRAPHITE	
70b	STEM FIRE SAFE SEAL	GRAPHITE	
72	STEM COVER	A105	
73	STEM COVER BOLT	A193-B7M	
74	STEM COVER NUT	A194-2HM	
76	VIPER SEAL	NBR	
80	LEVER / T-BAR TUBE	A395 / A53	LEVER OP.
82	STOPPER	A240-316	LEVER OP.
83	T-BAR SOCKET	A395	LEVER OP.
84	LEVER BOLT	A193-B8M	LEVER OP.
85	STOPPER BOLT	A193-B8M	LEVER OP.
87	LOCKING PLATE	A240-316	LEVER OP.
90	NAMEPLATE	A240-316	
92	ANTI STATIC SPRING	INCONEL X-750	
93	DRAIN PLUG	316SS	
94	BLEED VALVE	316SS	

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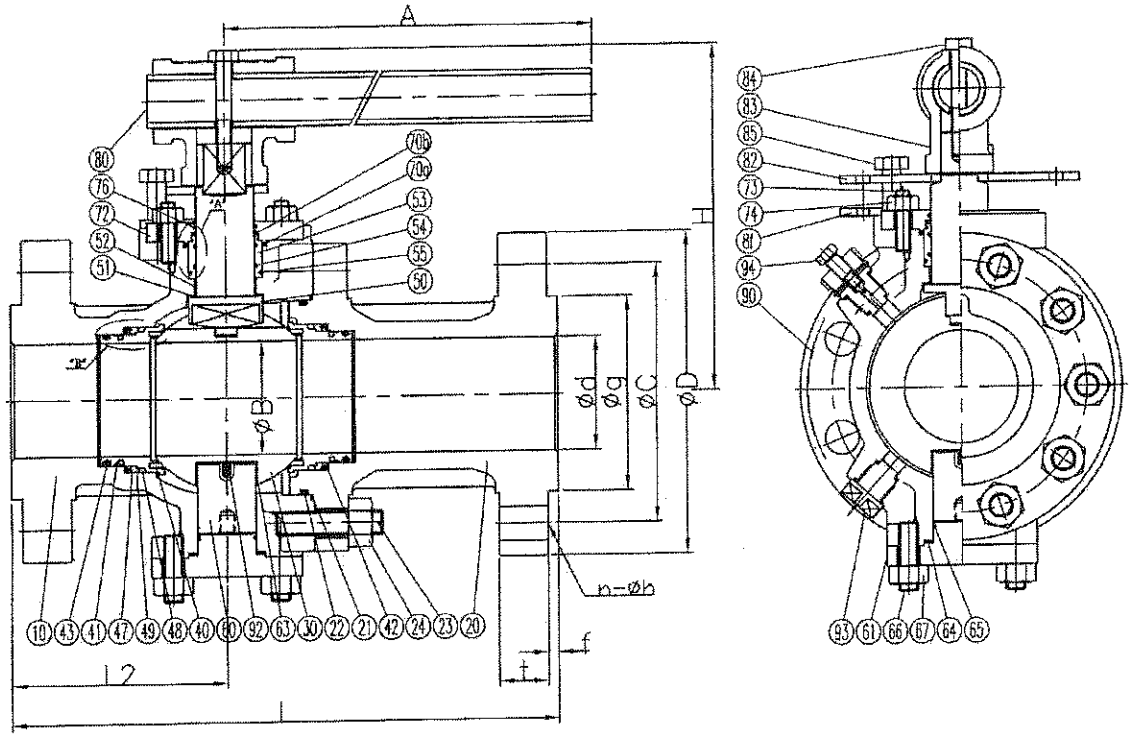
☑ REVIEWED
☐ WITNESSED
DATE



Hydraulic Test	Shell : 2225 Psi(157	Kg/Cm²)
	Back Seat : 1650 Psi(117	Kg/Cm²)
Pneumatic Test	Seat : 80 Psi(6	Kg/Cm²)

Seat Ring	Stellited (#6)
Wedge	Stellited (#6)
Valve Finishing	Phosphatized
End Connection	Socket Weld (ANSI B 16.11)

Rev. No.	Description	REV'D	APP'D
1			

TITLE: CAST STEEL 2-P BALL VALVE
CLASS 600 FLG'D FULL PORT

Refer to	ASME B16.34	Fig No.		D.W.G. No.	07112751-01
Drawn by	I.C.JUNG	Chk'd by	K.H.JUNG	App'd by	H.G.PARK

CLIENT :

S W I Valve Co., Ltd.

SIZE (Inch)	øB	L	L1	L2	A	H	End Connection							WEIGHT (kg)	Q'TY (pcs)	Tag No.
							ød	øD	øg	t	f	øC	n-øh			
2 X 2	49	292	-	120	450	195	49	165	92.1	25.4	7.0	127.0	8-ø19	23		
3 X 3	74	356	-	140	450	240	74	210	127.0	31.8	7.0	168.3	8-ø22	44		
4 X 4	100	432	-	180	600	285	100	275	157.2	38.1	7.0	215.9	8-ø26	72		

Energy & Process

TYPE APPOROVAL CERTIFICATE FOR GATE VALVE
No. 940013/3-CT-06

B.V. Job Ref: 3.30.1030.03

Inspection ordered to B.V. by (1) : SWI Valve Co. Ltd.
#1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Manufacturer : SWI Valve Co. Ltd., Korea
(1) the addressee of the original of this certificate ;

Description of the Supply / Subject of inspection :

Product : Forged Steel Gate Valve
Size of Tested Valve : 1"
Material of Tested Valve : ASTM A105N
Class of Tested Valve: #800
Stem Diameter : 11.1 mm
Tightness class : below 100ppm
Endurance class : 1500cycles
Temperature range : Room temperature to +260℃
Packing Adjustment number : 0

This certificate covers the whole of the supply: ☒ YES (no more inspection planned) ☐ NO (part of the supply still to be inspected)

Scope of the B.V. Survey :

- Witness for Type Test of Fugitive Emission Test

This supply complies with the following applicable document (s) : (2)

- API 622 Type Testing of Process Valve Packing for Fugitive Emissions

(2) and only for parts of the document(s) which concern the certification or the relevant service provided by Bureau Veritas.

List of enclosures: Test Report for Fugitive Emission Test ---------- 5 Pages

(or reference to enclosed list)
The certificate is valid together with enclosures (if listed) Only pages of enclosures (or parts of pages) which are stamped, are considered as part of this certificate.

Marking and Stamping on the items: None

Particulars or comments:
This is to certify that the following valves have been inspected by Bureau Veritas and found to be satisfactory in The Fugitive Emission Test in accordance with API 622 First Edition, August 2006.

Date of Issuance : 07-July-2010	Issued by :	Validated by :
Date of Inspection : 14 to 16-Jun-2010	Name : K. M. Kim	Name : Y. M. Moon
	Sign :	Sign :

Location of Inspection : BV-Korea, Seoul Office

BUREAU VERITAS SEOUL KOREA

This certificate is delivereec within the Scope of the General Conditions of Services of Bureau Veritas
Ce Certificat est délivré dans le cadre des Conditions Générales de Service du Bureau Veritas

This certificate is issued further to an inspection whose duration and scope were limited by the terms and conditions of the contract with BV principal. This certificate is NOT an indication that the item(s) is (are) fit for any specific purpose and does not release the manufacturer, supplier and any party from their respective duty, guarantee obligation and/or indemnity relating to, without limitation, patents, workmanship, materials, safety, performance in operation and/or reliability.

Ad ME 9613b

PROTOTYPE TEST FOR VALVE
ACCORDING TO API 622 FIRST EDITION , AUGUST 2006.

- Fugitive Emission Test equipment specification

1. Manufacturer : SWI VALVE CO. LTD.
2. Address : 1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea
3. Date of Test : 14th June,2010 to 16th June,2010

1 VALVE SPECIFICATION

Valve size & type	GATE Valve A105N/13CRFS SW 800# BB RB 1"
Material of Valve	A105N
Valve class	800#
Stem diameter	11.1 mm
Gland packing type	Graphite Braided Packing+Graphite Molded Packing Model No. : DAEWHA 6511+ 9001
Packing material	Graphite , Graphite + Inconel Wire
Operating torque	30 ft-lbs
Stroke	24.3 mm

2TEST CONDITION

Test pressure	136-110bar
Test medium	He 99%
Check medium	He 99%
Test temperature	RT/ 260℃
Test equipment	Fugitive emission test equip. manufactured by SWI VALVE CO. LTD.
Leakage measurement equipment	Helium Detector(ALCATEL Model ASM142 series)
Sampling method	Random
Valve repacking before test	0
Insulation of test valve	Heating Jacket used
Actuator	Geared motor

BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE

A.1- Fugitive Emissions Test Report Summary

API Std 622

Fugitive Emissions Testing Report Number: SWI- FET-06

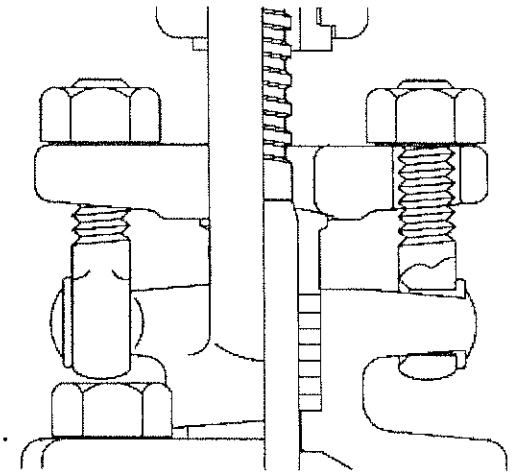
Application Profile : Check One ☐ Rotating ☑ Rising	Manufacturer: SWI VALVE CO. LTD. Description: Gate A105 #800 SW 1"
Testing Facility: SWI Factory Technician: JongWoo,Sohn Witness: Ki-Man , Kim Start date: 14TH June,2010 Completion: 16TH June,2010	Source: ☑ Manufacturer Date: 10th June,2010 ☐ Distributor Packaged: Indicate New or ☐ New Current Product ☑ Current
Gland Load Information psi. Gland Nut Torque :29 ft-lbs	
Notes concerning installation instructions	

Testing Profile Details

Test Segment	Leak measurement (ppm)	Temperature(℃)	Reference Temperature(℃) at packing gland	Flats Adjusted-Gland Nut Torque ft-lbs	Reference A Height (mm)	
Day1 Start,Ambient 0-250 cycles P=136(bar)	0	Room temp.	Room temp.	29	44.49	
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
	4	Room temp.	Room temp.			
	4	Room temp.	Room temp.			
	2	Room temp.	Room temp.			
High Temperature 250-500cycles P=110(bar)	25	260℃	220℃			
	29	260℃	220℃			
	36	260℃	220℃			
	37	260℃	220℃			
	38	260℃	220℃			
Day2 Start,Ambient 500-750 cycles P=136(bar)	12	Room temp.	Room temp.			
	26	Room temp.	Room temp.			
	29	Room temp.	Room temp.			
	34	Room temp.	Room temp.			
	39	Room temp.	Room temp.			
	42	Room temp.	Room temp.			
High Temperature 750-1000 cycles P=110(bar)	53	260℃	220℃			
	56	260℃	220℃			
	58	260℃	220℃			
	62	260℃	220℃			
	65	260℃	220℃			
Day3 Start,Ambient 1000-1250 cycles P=136(bar)	46	Room temp.	Room temp.			
	43	Room temp.	Room temp.			
	49	Room temp.	Room temp.			
	61	Room temp.	Room temp.			
	69	Room temp.	Room temp.			
	70	Room temp.	Room temp.			
High Temperature 1250-1500cycles P=110(bar)	73	260℃	220℃			
	79	260℃	220℃			
	83	260℃	220℃			
	89	260℃	220℃			
	92	260℃	220℃			

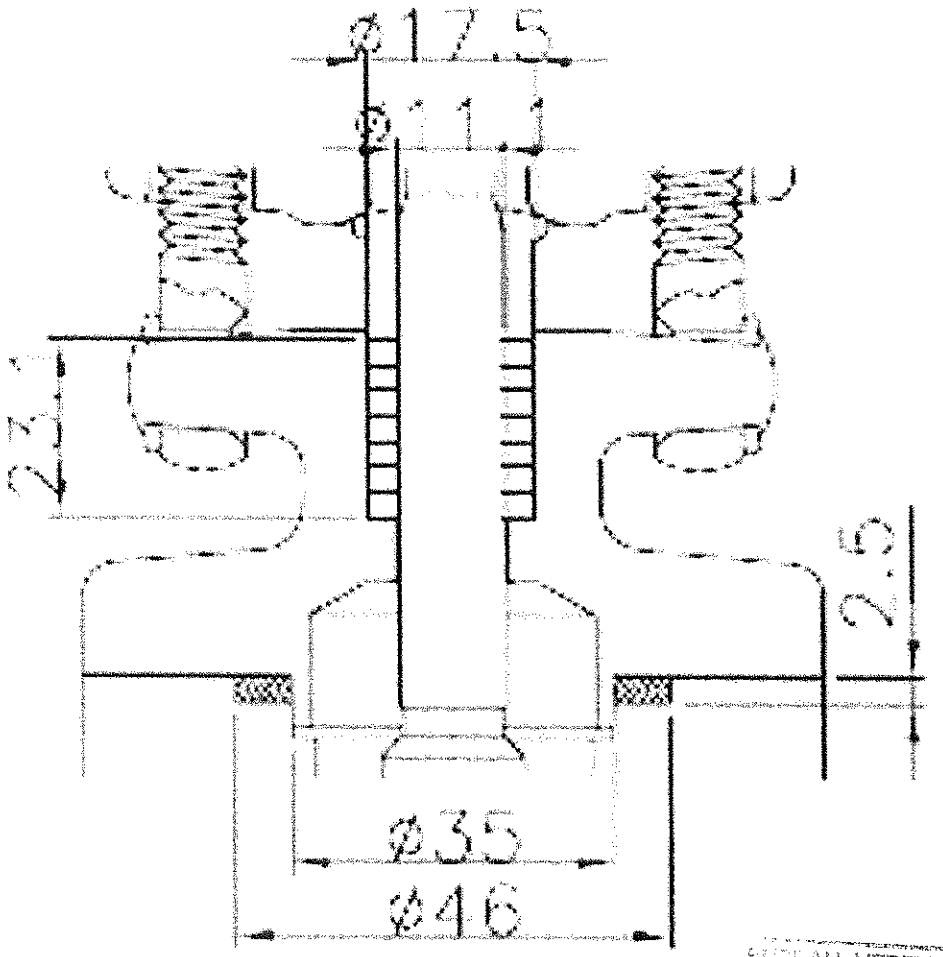
BUREAU VERITAS ☑ REVIEWED ☑ WITNESSED DATE

A graph depicting the test profile with associated leak checks and reajustments shall be provide by the testing authority.

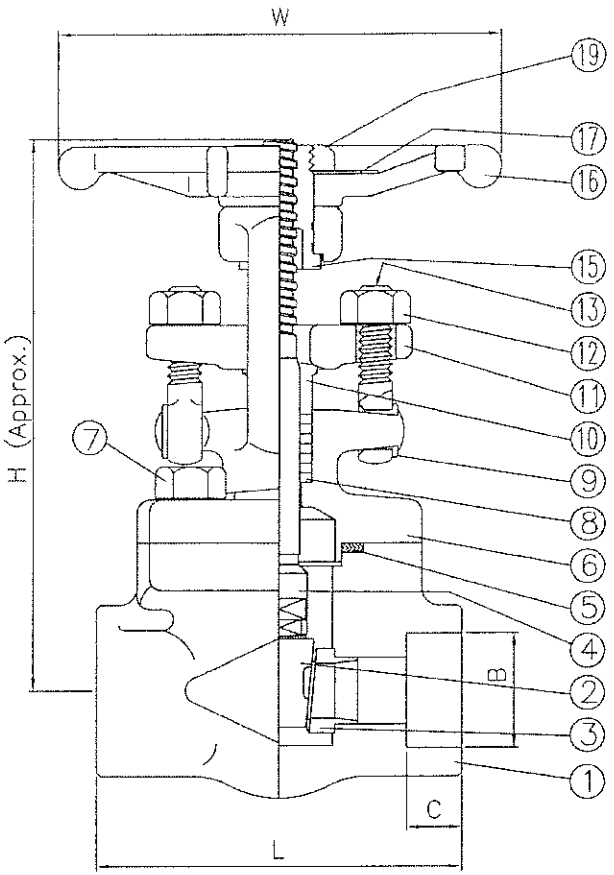
API Std 622 Emissions Testing Report Summary	
Test Number: SWI-FET-06	Test Date: 14th to 16th June , 2010
Packing Material: Graphite, Graphite+ inconel wire	Style Number:
Packing Manufacturer: DAEWHA 6511+ 9001	Source of Sample: GATE A105N/13CRFS SW 800# BB RB 1"
Test Packing Cross-section: Rectangle	Laboratory Name: SWI LABORATORY
	Location of Test: SWI FACTORY
Packing Gland OD and ID(at the packing): OD= 17.6 ID= 11.1	Packing Gland Bolt Diameter= 7.9 mm
Number of Mechanical Cycles: 750	Packing Compression % of Free Height= 80%
	Torque on Gland Nuts(each side)=29/29 (ft-lbs)
Number of Thermal Cycles: 750	Mechanical Cycles Prior to Readjustment: Non-applicable
Maximum Test Pressure: 136 bar	Number of Readjustments: 0
Packing Configuration: Graphite + Graphite with inconel wire Number of rings tested: 7 Circle the following Ring shape(square, circular, vee) Solid or split Braided Die formed Spool stock Wire or other reinforcement Corrosion inhibitor &type Other	Show Sketch of Packing Installation-define each ring: 

BUREAU VERITAS
☑REVIEWED
☑WITNESSED
DATE 05 July 2010

TEST CHECKED BY :	TEST APPROVED BY :
JONG WOO , SOHN	YONG PYO, CHO
DATE: July 5TH , 2010	DATE: : July 5TH , 2010



Gale



BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE

ORDER NO. :

BILL OF MATERIALS

NO.	PARTS	MATERIALS	ASTM
1	Body	Forged Steel	A105N
2	Wedge	Stainless Steel	A351-CF8M
3	Seat Ring	Stainless Steel	A276-316
4	Stem	Stainless Steel	A276-316
5	Gasket	316 Hoop + Graphite	
6	Bonnet	Forged Steel	A105N
7	Bonnet Bolt	Alloy Steel	A193-B7
8	Gland Packing	Graphite + Carbon Fiber	
9	Retaining Washer	Stainless Steel	A276-304
10	Gland	Stainless Steel	A276-316
11	Gland Flange	Forged Steel	A105
12	Gland Nut	Carbon Steel	A194-2H
13	Eye Bolt	Stainless Steel	A276-304
15	Yoke Sleeve	13Cr Stainless Steel	A276-410
16	Handwheel	Malleable Iron	A47
17	Name Plate	Aluminum	
19	Handwheel Nut	Carbon Steel	A563A

Hydraulic Test	Shell : 2975 Psi(210 Kg/Cm^2)	
	Back Seat : 2175 Psi(153 Kg/Cm^2)	
Pneumatic Test	Seat : 80 Psi(6 Kg/Cm^2)	
Seat Ring	Stellited (#6)	
Wedge	Stellited (#6)	
Valve Finishing	Phosphatized	
End Connection	Socket Weld (ANSI B 16.11)	

Rev. No.	Description	REV'D	APP'D
3			
2			
1			

SIZE (Inch)	H (Open)	L	W	Port Dia.	End Connection		Weight (Kg)	Q'TY (pcs)	Valve No.
					B	C			
1/2	145	76	102	9.5	21.8	10	1.5		
3/4	151	86	102	12.7	27.2	13	2.0		
1	190	102	114	18.0	33.9	13	2.8		
1-1/4	241	117	140	31.0	42.7	13	5.2		
1-1/2	241	117	140	31.0	48.8	13	5.1		
2	271	133	165	37.0	61.2	16	8.2		

TITLE FORGED STEEL GATE VALVE CLASS 800
BB OS & Y S.W REDUCED PORT

Refer to	API 602	Fig No.		D.W.G. No.	09020651-01
Drawn by	I.C.JUNG	Chk'd by	J.B.CHOI	App'd by	K.H.JUNG

CLIENT :

S W I Valve Co., Ltd.

Energy & Process

TYPE APPOROVAL CERTIFICATE FOR GLOBE VALVE
No. 940013/3-CT-07

B.V. Job Ref: 3.30.1030.03

Inspection ordered to B.V. by (1) : SWI Valve Co. Ltd.
#1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Manufacturer : SWI Valve Co. Ltd., Korea
(1) the addressee of the original of this certificate ;

Description of the Supply / Subject of inspection :

Product : Forged Steel Globe Valve
Material of Tested Valve : ASTM A105N
Size of Tested Valve: 1"
Class of Tested Valve: #800
Stem Diameter : 12.7 mm
Tightness class : below 100ppm
Endurance class : 1500cycles
Temperature range : Room temperature to +260℃
Packing adjustment number: 0

This certificate covers the whole of the supply: ☒ YES (no more inspection planned) ☐ NO (part of the supply still to be inspected)

Scope of the B.V. Survey :

- Witness for Type Test of Fugitive Emission Test

This supply complies with the following applicable document (s) : (2)

- API 622 Type Testing of Process Valve Packing for Fugitive Emissions

(2) and only for parts of the document(s) which concern the certification or the relevant service provided by Bureau Veritas.

List of enclosures: Test Report for Fugitive Emission Test ---------- 5 Pages

(or reference to enclosed list)
The certificate is valid together with enclosures (if listed). Only pages of enclosures (or parts of pages) which are stamped, are considered as part of this certificate.

Marking and Stamping on the items: None

Particulars or comments:
This is to certify that the following valves have been inspected by Bureau Veritas and found to be satisfactory in The Fugitive Emission Test in accordance with API 622 First Edition, August 2006.

Date of Issuance : 07-July-2010
Date of Inspection : 17 to 19-Jun-2010

Issued by :
Name : K. M. Kim
Sign :

Validated by :
Name : Y. M. Moon
Sign :

Location of Inspection : BV-Korea, Seoul Office

BUREAU VERITAS SEOUL 3 KOREA

This certificate is delivered within the Scope of the General Conditions of Services of Bureau Veritas
Ce Certificat est délivré dans le cadre des Conditions Générales de Service du Bureau Veritas

This certificate is issued further to an inspection whose duration and scope were limited by the terms and conditions of the contract with BV principal. This certificate is NOT an indication that the item(s) is (are) fit for any specific purpose and does not release the manufacturer, supplier and any party from their respective duty, guarantee, obligation and/or indemnity relating to, without limitation, patents, workmanship, materials, safety, performance in operation and/or reliability.

Ad ME 9613b

PROTOTYPE TEST FOR VALVE
ACCORDING TO API 622 FIRST EDITION , AUGUST 2006.

- Fugitive Emission Test equipment specification

1. Manufacturer : SWI VALVE CO. LTD.
2. Address : 1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea
3. Date of Test : 17th June,2010 to 19th June,2010

1 VALVE SPECIFICATION

Valve size & type	GLOBE Valve A105N/13CRFS SW 800# BB RB 1"
Material of Valve	A105N
Valve class	800#
Stem diameter	12.7 mm
Gland packing type	Graphite Braided Packing+Graphite Molded Packing Model No. : DAEWHA 6511+ 9001
Packing material	Graphite , Graphite + Inconel Wire
Operating torque	30 ft-lbs
Stroke / Angle	7.8 mm

2TEST CONDITION

Test pressure	136-110bar
Test medium	He 99%
Check medium	He 99%
Test temperature	RT/ 260℃
Test equipment	Fugitive emission test equip. manufactured by SWI VALVE CO. LTD.
Leakage measurement equipment	Helium Detector(ALCATEL Model ASM142 series)
Sampling method	Random
Valve repacking before test	0
Insulation of test valve	Heating Jacket used
Actuator	Geared motor

BUREAU VERITAS
REVIEWED
WITNESSED
DATE

A.1- Fugitive Emissions Test Report Summary

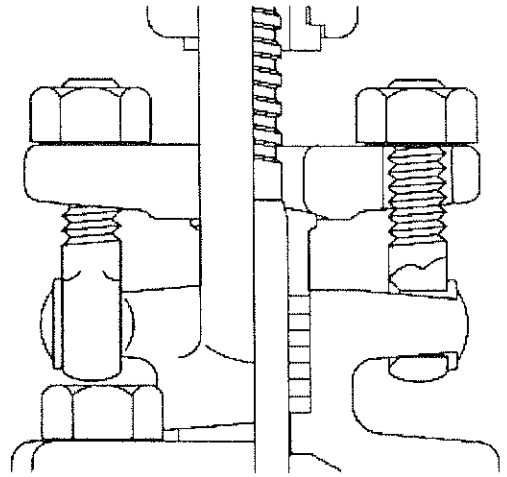
API Std 622 Fugitive Emissions Testing Report Number: SWI-FET-07	
Application Profile : Check One ☐ Rotating ☑ Rising	Manufacturer: SWI VALVE CO. LTD. Description: Globe A105 800# SW 1"
Testing Facility: SWI Factory Technician: JongWoo, Sohn Witness: Ki-Man , Kim Start date: 17TH June,2010 Completion. 19TH June,2010	Source: ☑ Manufacturer Date: 10th June,2010 ☐ Distributor Packaged: Indicate New or ☐ New Current Product ☑ Current
Gland Load Information psi. Gland Nut Torque : 28 ft-lbs	
Notes concerning installation instructions	

Testing Profile Details

Test Segment	Leak measurement (ppm)	Temperature(℃)	Reference Temperature(℃) at packing gland	Flats Adjusted-Gland Nut Torque ft-lbs	Reference A Height (mm)	
Day1 Start,Ambient 0-250 cycles P=136(bar)	0	Room temp.	Room temp.	28	44.5	
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
	4	Room temp.	Room temp.			
	4	Room temp.	Room temp.			
	6	Room temp.	Room temp.			
High Temperature 250-500cycles P=110(bar)	22	260℃	220℃			
	27	260℃	220℃			
	35	260℃	220℃			
	36	260℃	220℃			
	38	260℃	220℃			
Day2 Start,Ambient 500-750 cycles P=136(bar)	10	Room temp.	Room temp.			
	22	Room temp.	Room temp.			
	24	Room temp.	Room temp.			
	31	Room temp.	Room temp.			
	36	Room temp.	Room temp.			
	41	Room temp.	Room temp.			
High Temperature 750-1000 cycles P=110(bar)	49	260℃	220℃			
	52	260℃	220℃			
	52	260℃	220℃			
	57	260℃	220℃			
	59	260℃	220℃			
Day3 Start,Ambient 1000-1250 cycles P=136(bar)	43	Room temp.	Room temp.			
	45	Room temp.	Room temp.			
	46	Room temp.	Room temp.			
	55	Room temp.	Room temp.			
	57	Room temp.	Room temp.			
	62	Room temp.	Room temp.			
High Temperature 1250-1500cycles P=110(bar)	68	260℃	220℃			
	72	260℃	220℃			
	78	260℃	220℃			
	79	260℃	220℃			
	85	260℃	220℃			

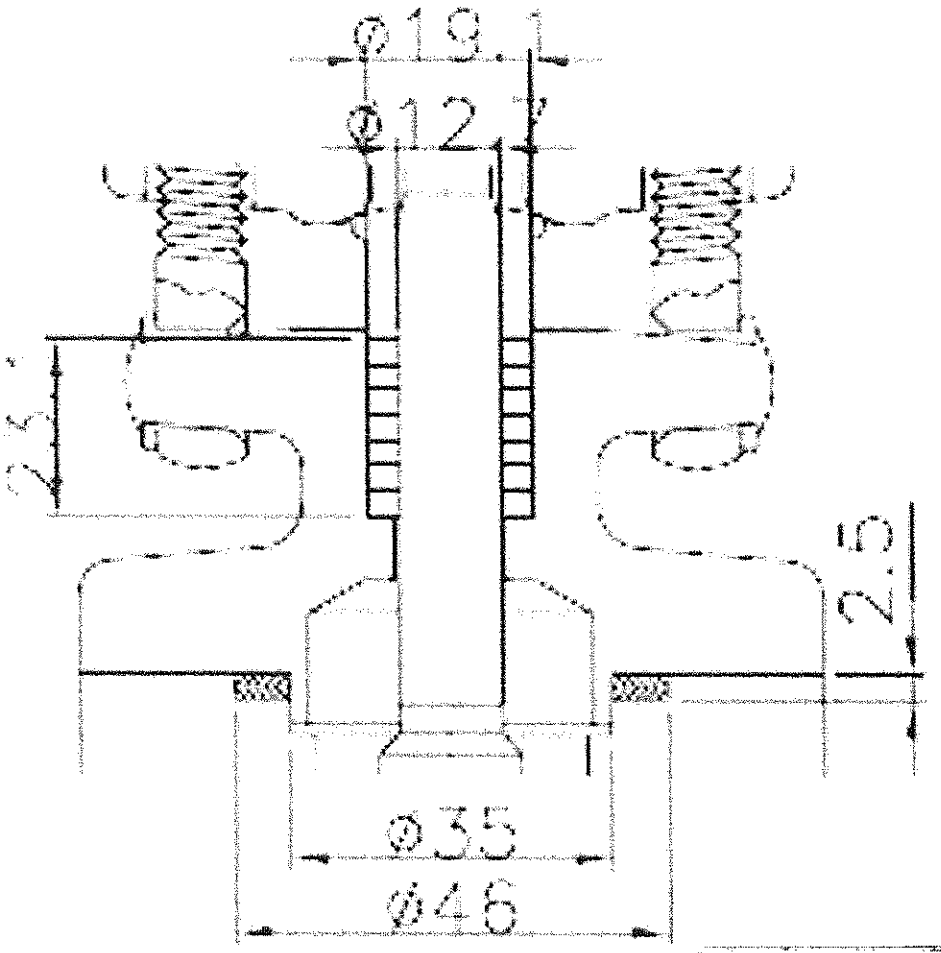
BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE

A graph depicting the test profile with associated leak checks and reajustments shall be provide by the testing authority.

API Std 622 Emissions Testing Report Summary	
Test Number: SWI-FET-07	Test Date: 17th to19th June , 2010
•Packing Material: Graphite, Graphite+ inconel wire	Style Number:
Packing Manufacturer: DAEWHA 6511+ 9001	Source of Sample: GLOBE A105N/13CRFS SW BB RB 800# 1"
Test Packing Cross-section: Rectangle	Laboratory Name: SWI LABORATORY
	Location of Test: SWI FACTORY
Packing Gland OD and ID(at the packing): OD= 19.1 ID= 12.7	Packing Gland Bolt Diameter= 7.9 mm
Number of Mechanical Cycles: 750	Packing Compression % of Free Height= 80%
	Torque on Gland Nuts(each side)= 28/28 (ft-lbs)
Number of Thermal Cycles: 750	Mechanical Cycles Prior to Readjustment: Non-applicable
Maximum Test Pressure: 136 bar	Number of Readjustments: 0
Packing Configuration: Graphite + Graphite with inconel wire Number of rings tested: 7 Circle the following Ring shape(square, circular, vee) Solid or split Braided Die formed Spool stock Wire or other reinforcement Corrosion inhibitor &type Other	Show Sketch of Packing Installation-define each ring: 

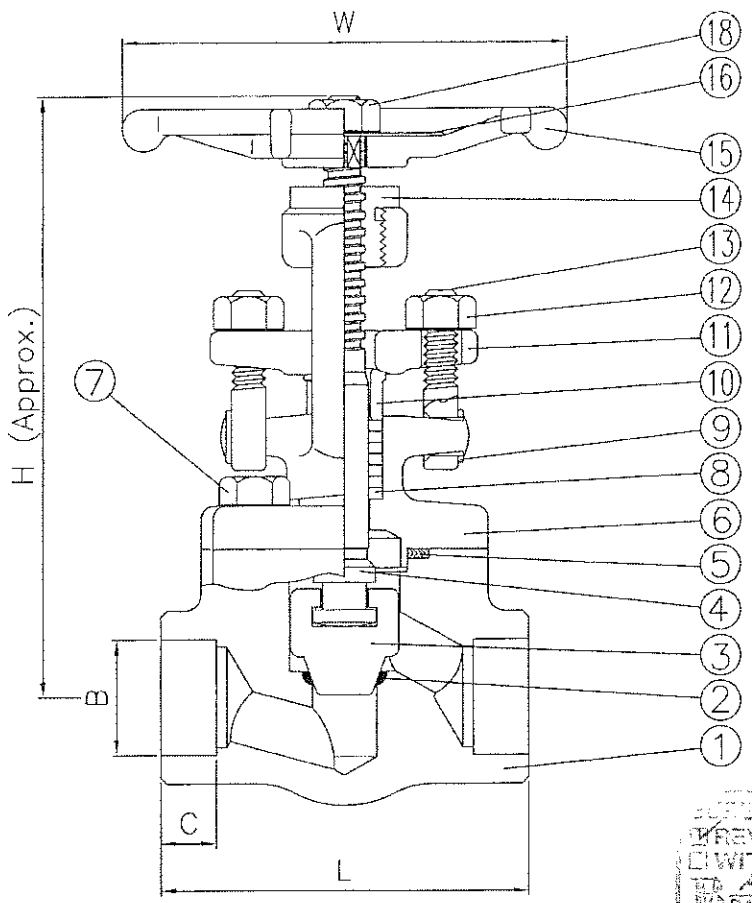
BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE

TEST CHECKED BY :	TEST APPROVED BY :
JONG WOO , SOHN	YONG PYO, CHO
DATE: July 5TH , 2010	DATE: : July 5TH , 2010



BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE

Globe



BUREAU VERITAS
REVIEWED
WITNESSED
DATE

ORDER NO. :

BILL OF MATERIALS

NO.	PARTS	MATERIALS	ASTM
1	Body	Forged Steel	A105N
2	Seat	Stellite Hardfacing	
3	Disc	13Cr Stainless Steel	A217-CA15
4	Stem	13Cr Stainless Steel	A276-410
5	Gasket	304 Hoop + Graphite	
6	Bonnet	Forged Steel	A105N
7	Bonnet Bolt	Alloy steel	A193-B7
8	Gland Packing	Graphite + Carbon Fiber	
9	Ret. Washer	Stainless Steel	A276-304
10	Gland	Stainless Steel	A276-316
11	Gland Flange	Forged Steel	A105
12	Gland Nut	Carbon Steel	A194-2H
13	Eye Bolt	Stainless Steel	A276-304
14	Yoke Bush	13Cr Stainless Steel	A276-410
15	Handwheel	Malleable Iron	A47
16	Name Plate	Aluminum	
18	Handwheel Nut	Carbon Steel	A194-2H

Hydraulic Test	Shell : 2975 Psi(210 Kg/Cm²)
	Back Seat : 2175 Psi(153 Kg/Cm²)
	Seat : 2175 Psi(153 Kg/Cm²)
Seat of Body	Hardfaced with Stellite #6 on Body
Disc	Stellited (#6)
Valve Finishing	Phosphatized
End Connection	Socket Weld (ANSI B 16.11)

Rev. No.	Description	REV'D	APP'D
3			
2			
1			

SIZE (Inch)	H (Open)	L	W	Port Dia.	End Connection B	End Connection C	Weight (Kg)	Q'TY (pcs)	Valve No.
1/2	146	76	102	9.5	21.8	10	1.8		
3/4	152	86	102	12.7	27.2	13	2.1		
1	188	102	114	17.5	33.9	13	2.9		
1-1/4	219	152	140	22.5	42.7	13	6.4		
1-1/2	219	152	140	29.5	48.8	13	6.2		
2	260	172	165	35.0	61.2	16	9.7		

TITLE FORGED STEEL GLOBE VALVE CLASS 800
BB OS & Y S.W REDUCED PORT

Refer to	API602 / BS5352	Fig No.		D.W.G. No.	10032651-01
Drawn by	I.C.JUNG	Chk'd by	J.B.CHOI	App'd by	K.H.JUNG

CLIENT :

S W I Valve Co., Ltd.

BUREAU VERITAS

Energy & Process

TYPE APPOROVAL CERTIFICATE FOR GATE BELLOWS VALVE
No. 940013/3-CT-08

B.V. Job Ref: 3.30.1030.03

Inspection ordered to B.V. by (1) : SWI Valve Co. Ltd.
#1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Manufacturer : SWI Valve Co. Ltd., Korea
(1) the addressee of the original of this certificate :

Description of the Supply / Subject of inspection :

Product : Forged Steel Gate Bellows Valve
Size of Tested Valve: 1"
Material of Tested Valve : ASTM A105N
Class of Tested Valve: #800
Stem Diameter : 11.1 mm
Tightness class : below 100ppm
Endurance class : 1500cycles
Temperature range : Room temperature to +260℃
Packing adjustment number: 0

This certificate covers the whole of the supply: ☒ YES (no more inspection planned) ☐ NO (part of the supply still to be inspected)

Scope of the B.V. Survey :

- Witness for Type Test of Fugitive Emission Test

This supply complies with the following applicable document (s) : (2)

- API 622 Type Testing of Process Valve Packing for Fugitive Emissions

(2) and only for parts of the document(s) which concern the certification or the relevant service provided by Bureau Veritas.

List of enclosures: Test Report for Fugitive Emission Test ---------- 5 Pages

(or reference to enclosed list)
The certificate is valid together with enclosures (if listed). Only pages of enclosures (or parts of pages) which are stamped, are considered as part of this certificate.

Marking and Stamping on the items: None

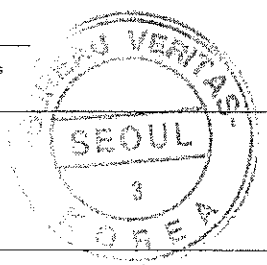
Particulars or comments:
This is to certify that the following valves have been inspected by Bureau Veritas and found to be satisfactory in The Fugitive Emission Test in accordance with API 622 First Edition, August 2006.

Date of Issuance : 07-July-2010
Date of Inspection : 21 to 23-Jun-2010

Issued by :
Name : K. M. Kim
Sign :

Validated by :
Name : Y. M. Moon
Sign :

Location of Inspection : BV-Korea, Seoul Office



PROTOTYPE TEST FOR VALVE
ACCORDING TO API 622 FIRST EDITION , AUGUST 2006.

- Fugitive Emission Test equipment specification

1. Manufacturer : SWI VALVE CO. LTD.
2. Address : 1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea
3. Date of Test : 21st June,2010 to 23rd June,2010

1 VALVE SPECIFICATION

Valve size & type	GATE Bellows Valve A105N/13CRFS SW 800# WB RB 1"
Material of Valve	A105N
Valve class	800#
Stem diameter	11.1 mm
Gland packing type	Graphite Braided Packing+Graphite Molded Packing Model No. : DAEWHA 6511+ 9001
Packing material	Graphite , Graphite + Inconel Wire
Operating torque	21 ft-lbs
Stroke / Angle	24.3mm

2TEST CONDITION

Test pressure	136-110bar
Test medium	He 99%
Check medium	He 99%
Test temperature	RT/ 260℃
Test equipment	Fugitive emission test equip. manufactured by SWI VALVE CO. LTD.
Leakage measurement equipment	Helium Detector(ALCATEL Model ASM142 series)
Sampling method	Random
Valve repacking before test	0
Insulation of test valve	Heating Jacket used
Actuator	Geared motor

BUREAU VERITAS
☑ REVIEWED
☑ WITNESSED
DATE

A.1- Fugitive Emissions Test Report Summary

API Std 622

Fugitive Emissions Testing Report Number: SWI-FET-08

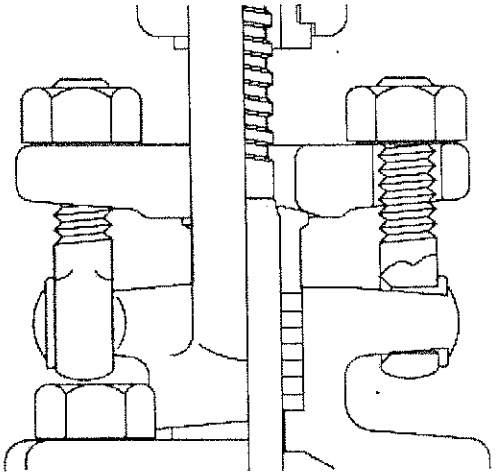
Application Profile : Check One ☐ Rotating ☑ Rising	Manufacturer: SWI VALVE CO. LTD. Description: Gate bellows A105 800# SW 1"
Testing Facility: SWI Factory Technician: JongWoo,Sohn Witness: Ki-Man , Kim Start date: 21ST June,2010 Completion: 23RD June,2010	Source: ☑ Manufacturer Date: 10th June,2010 ☐ Distributor Packaged: Indicate New or ☐ New Current Product ☑ Current
Gland Load nformation psi. Gland Nut Torque : 25 ft-lbs	
Notes concerning installation instructions	

Testing Profile Details

Test Segment	Leak measurement (ppm)	Temperature(℃)	Reference Temperature(℃) at packing gland	Flats Adjusted-Gland Nut Torque ft-lbs	Reference A Height (mm)	
Day1 Start.Ambient 0-250 cycles P=136(bar)	0	Room temp.	Room temp.	25	44.51	
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
High Temperature 250-500cycles P=110(bar)	1	260℃	220℃			
	3	260℃	220℃			
	6	260℃	220℃			
	7	260℃	220℃			
	6	260℃	220℃			
Day2 Start,Ambient 500-750 cycles P=136(bar)	2	Room temp.	Room temp.			
	3	Room temp.	Room temp.			
	3	Room temp.	Room temp.			
	6	Room temp.	Room temp.			
	8	Room temp.	Room temp.			
	9	Room temp.	Room temp.			
High Temperature 750-1000 cycles P=110(bar)	12	260℃	220℃			
	23	260℃	220℃			
	25	260℃	220℃			
	26	260℃	220℃			
	28	260℃	220℃			
Day3 Start.Ambient 1000-1250 cycles P=136(bar)	12	Room temp.	Room temp.			
	22	Room temp.	Room temp.			
	23	Room temp.	Room temp.			
	26	Room temp.	Room temp.			
	29	Room temp.	Room temp.			
	34	Room temp.	Room temp.			
High Temperature 1250-1500cycles P=110(bar)	19	260℃	220℃			
	21	260℃	220℃			
	26	260℃	220℃			
	29	260℃	220℃			
	35	260℃	220℃			

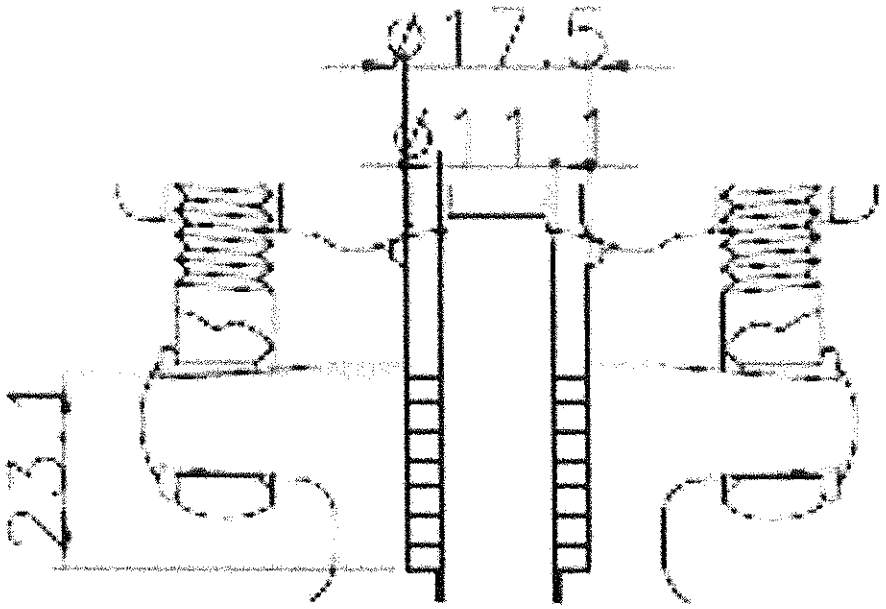
A graph depicting the test profile with associated leak checks and reajustments shall be provide by the testing authority.

BUREAU VERITAS
☑ REVIEWED
☐ WITNESSED
DATE

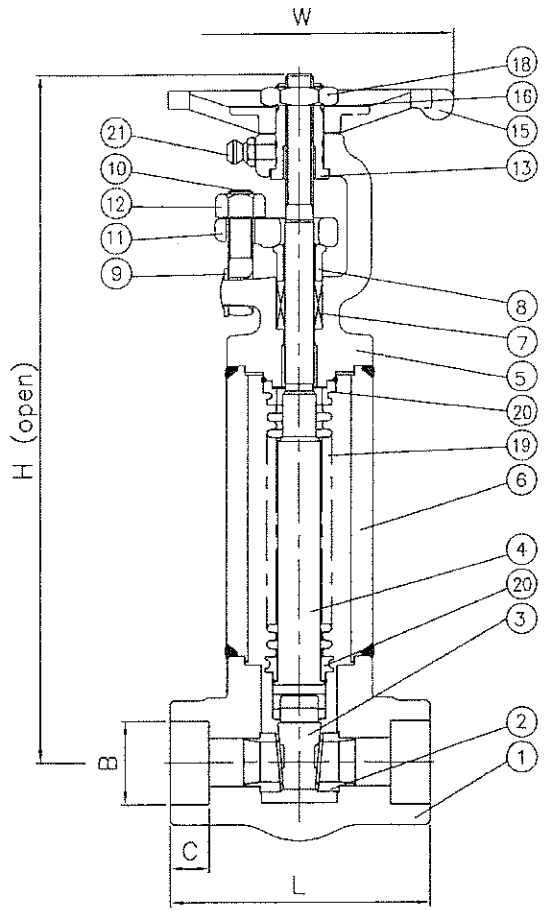
API Std 622 Emissions Testing Report Summary	
Test Number: SWI-FET-08	Test Date: 21st to 23rd June , 2010
Packing Material: Graphite, Graphite+ inconel wire	Style Number:
Packing Manufacturer: DAEWHA 6511+ 9001	Source of Sample: GATE BLWS A105N/13RFS SW 800# WB RB 1"
Test Packing Cross-section: Rectangle	Laboratory Name: SWI LABORATORY
	Location of Test: SWI FACTORY
Packing Gland OD and ID(at the packing): OD= 17.6 ID= 11.1	Packing Gland Bolt Diameter= 7.9 mm
Number of Mechanical Cycles: 750	Packing Compression % of Free Height= 80%
	Torque on Gland Nuts(each side)= 25/25 (ft-lbs)
Number of Thermal Cycles: 750	Mechanical Cycles Prior to Readjustment: Non-applicable
Maximum Test Pressure: 136 bar	Number of Readjustments: 0
Packing Configuration: Graphite + Graphite with inconel wire Number of rings tested: 7 Circle the following Ring shape(square, circular, vee) Solid or split Braided Die formed Spool stock Wire or other reinforcement Corrosion inhibitor &type Other	Show Sketch of Packing Installation-define each ring: 

BUREAU VERITAS
REVIEWED
WITNESSED
DATE 15/July/2010

TEST CHECKED BY :	TEST APPROVED BY :
JONG WOO , SOHN	YONG PYO, CHO
DATE: July 5TH , 2010	DATE: : July 5TH , 2010



Bellows Gate



BUREAU VERITAS
REVIEWED
WITNESSED
DATE

ORDER NO. :

BILL OF MATERIALS

NO.	PARTS	MATERIALS	ASTM
1	Body	Forged Steel	A105
2	Seat Ring	13Cr Stainless Steel	A276-410
3	Wedge	13Cr Stainless Steel	A743-CA40
4	Stem	13Cr Stainless Steel	A276-410
5	Bonnet	Forged Steel	A105
6	Connector	Carbon Steel	A105/A106-B
7	Gland Packing	Graphite + Carbon Fiber	
8	Gland	Stainless Steel	A276-304
9	Ret. Washer	Stainless Steel	A276-304
10	Eye Bolt	Stainless Steel	A276-304
11	Gland Flange	Forged Steel	A105
12	Gland Nut	Carbon Steel	A194-2H
13	Yoke Sleeve	13Cr Stainless Steel	
15	Handwheel	Malleable Iron	A47
16	Name Plate	Aluminum	
18	Handwheel Nut	Carbon Steel	A563A
19	Bellows	Stainless Steel	321SS
20	End Fitting	Stainless Steel	316SS
21	Grease Nipple	Carbon Steel + Cr Plated	

Hydraulic Test	Shell : 2975 Psi(209.5 Kg/Cm²)
	Back Seat : 2175 Psi(153 Kg/Cm²)
Pneumatic Test	Seat : 80 Psi(6 Kg/Cm²)
Seat Ring	Stellited (#6)
Wedge	Stellited (#6)
Valve Finishing	Phosphatized
End Connection	Socket Weld (ANSI B 16.11)

Rev. No.	Description	REV'D	APP'D
3			
2			
1			

SIZE (Inch)	H (Open)	L	W	Port Dia.	End Connection B	End Connection C	Weight (Kg)	Q'TY (pcs)	Valve No.
1/2	226	76	102	9.5	21.8	10	2.4		
3/4	243	86	102	12.7	27.2	13	3.1		
1	306	102	114	18.0	33.9	13	4.0		
1-1/4	395	117	140	31.0	42.7	13	8.1		
1-1/2	395	117	140	31.0	48.8	13	8.1		
2	459	133	165	37.0	61.2	16	12.9		

TITLE FORGED STEEL BELLOWS GATE VALVE
CLASS 800 WB OS & Y S.W REDUCED PORT

Refer to	API 602	Fig No.		D.W.G. No.	07112751-01
Drawn by	I.C.JUNG	Chk'd by	K.H.JUNG	App'd by	H.G.PARK

CLIENT :

S W I Valve Co., Ltd.

BUREAU VERITAS

Energy & Process

TYPE APPOROVAL CERTIFICATE FOR GLOBE BELLOWS VALVE
No. 940013/3-CT-09

B.V. Job Ref: 3.30.1030.03

Inspection ordered to B.V. by (1) : SWI Valve Co. Ltd.
#1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Manufacturer : SWI Valve Co. Ltd., Korea
(1) the addressee of the original of this certificate ;

Description of the Supply / Subject of inspection :

Product : Forged Steel Globe Bellows Valve
Size of Tested Valve: 1"
Material of Tested Valve : ASTM A105N
Class of Tested Valve: #800
Stem Diameter : 12.7 mm
Tightness class : below 100ppm
Endurance class : 1500cycles
Temperature range : Room temperature to +260℃
Packing adjustment number: 0

This certificate covers the whole of the supply: ☒ YES (no more inspection planned) ☐ NO (part of the supply still to be inspected)

Scope of the B.V. Survey :

- Witness for Type Test of Fugitive Emission Test

This supply complies with the following applicable document (s) : (2)

- API 622 Type Testing of Process Valve Packing for Fugitive Emissions

(2) and only for parts of the document(s) which concern the certification or the relevant service provided by Bureau Veritas.

List of enclosures: Test Report for Fugitive Emission Test ---------- 5 Pages

(or reference to enclosed list)
The certificate is valid together with enclosures (if listed). Only pages of enclosures (or parts of pages) which are stamped, are considered as part of this certificate.

Marking and Stamping on the items: None

Particulars or comments:
This is to certify that the following valves have been inspected by Bureau Veritas and found to be satisfactory in The Fugitive Emission Test in accordance with API 622 First Edition, August 2006.

Date of Issuance : 07-July-2010
Date of Inspection : 24 to 26-Jun-2010

Issued by :
Name : K. M. Kim
Sign :

Validated by :
Name : Y. M. Moon
Sign :

Location of Inspection : BV-Korea, Seoul Office

This certificate is delivered within the Scope of the General Conditions of Services of Bureau Veritas
Ce Certificat est délivré dans le cadre des Conditions Générales de Service du Bureau Veritas

This certificate is issued further to an inspection whose duration and scope were limited by the terms and conditions of the contract with BV principal. This certificate is NOT an indication that the item(s) is (are) fit for any specific purpose and does not release the manufacturer, supplier and any party from their respective duty, guarantee, obligation and/or indemnity relating to, without limitation, patents, workmanship, materials, safety, performance in operation and/or reliability	

BUREAU VERITAS SEOUL KOREA

Ad ME 9613b

PROTOTYPE TEST FOR VALVE
ACCORDING TO API 622 FIRST EDITION , AUGUST 2006.

- Fugitive Emission Test equipment specification

1. Manufacturer : SWI VALVE CO. LTD.
2. Address : 1023-2 Gwanyang 1-dong,Dongan-gu,
   Anyang-si, Gyeonggi-do, Korea
3. Date of Test : 24th June,2010 to 26th June,2010

1 VALVE SPECIFICATION

Valve size & type	GLOBE Bellows Valve A105N/13CRFS SW 800# WB RB 1"
Material of Valve	A105N
Valve class	800#
Stem diameter	12.7 mm
Gland packing type	Graphite Braided Packing+Graphite Molded Packing Model No. : DAEWHA 6511+ 9001
Packing material	Graphite , Graphite + Inconel Wire
Operating torque	23 ft-lbs
Stroke / Angle	7.8mm

2TEST CONDITION

Test pressure	136-110bar
Test medium	He 99%
Check medium	He 99%
Test temperature	RT/ 260℃
Test equipment	Fugitive emission test equip. manufactured by SWI VALVE CO. LTD.
Leakage measurement equipment	Helium Detector(ALCATEL Model ASM142 series)
Sampling method	Random
Valve repacking before test	0
Insulation of test valve	Heating Jacket used
Actuator	Geared motor

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A.1- Fugitive Emissions Test Report Summary

API Std 622

Fugitive Emissions Testing Report Number: SWI –FET- 09

Application Profile : Check One ☐ Rotating ☑ Rising	Manufacturer: SWI VALVE CO. LTD. Description: Globe BLWS A105N 800# 1"
Testing Facility: SWI Factory Technician: JongWoo,Sohn Witness: Ki-Man , Kim Start date: 24TH June,2010 Completion: 26TH June,2010	Source: ☑ Manufacturer Date: 10th June,2010 ☐ Distributor Packaged: Indicate New or ☐ New Current Product ☑ Current
Gland Load Information psi. Gland Nut Torque: 27 ft-lbs	
Notes concerning installation instructions	

Testing Profile Details

Test Segment	Leak measurement (ppm)	Temperature(℃)	Reference Temperature(℃) at packing gland	Flats Adjusted-Gland Nut Torque ft-lbs	Reference A Height (mm)	
Day1 Start,Ambient 0-250 cycles P=136 (bar)	0	Room temp.	Room temp.	27	44.51	
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
High Temperature 250-500cycles P=110(bar)	2	260℃	220℃			
	3	260℃	220℃			
	6	260℃	220℃			
	8	260℃	220℃			
	8	260℃	220℃			
Day2 Start,Ambient 500-750 cycles P=136(bar)	1	Room temp.	Room temp.			
	4	Room temp.	Room temp.			
	5	Room temp.	Room temp.			
	5	Room temp.	Room temp.			
	6	Room temp.	Room temp.			
	8	Room temp.	Room temp.			
High Temperature 750-1000 cycles P=110(bar)	11	260℃	220℃			
	15	260℃	220℃			
	15	260℃	220℃			
	17	260℃	220℃			
	18	260℃	220℃			
Day3 Start,Ambient 1000-1250 cycles P=136(bar)	10	Room temp.	Room temp.			
	13	Room temp.	Room temp.			
	15	Room temp.	Room temp.			
	16	Room temp.	Room temp.			
	18	Room temp.	Room temp.			
	19	Room temp.	Room temp.			
High Temperature 1250-1500cycles P=110(bar)	22	260℃	220℃			
	23	260℃	220℃			
	24	260℃	220℃			
	28	260℃	220℃			
	32	260℃	220℃			

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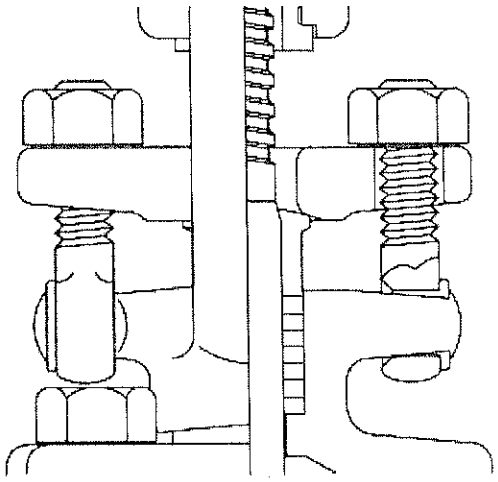
A grqph depicting the test profile with associated leak checks and reajustments shall be provide by the testing authority.

API Std 622 Emissions Testing Report Summary	
Test Number: SWI-FET-09	Test Date: 24TH to 26TH June , 2010
Packing Material: Graphite, Graphite+ inconel wire	Style Number:
Packing Manufacturer: DAEWHA 6511+ 9001	Source of Sample: GLOBE BLWS A105N/13RFS SW 800# WB RB 1"
Test Packing Cross-section: Rectangle	Laboratory Name: SWI LABORATORY
	Location of Test: SWI FACTORY
Packing Gland OD and ID(at the packing): OD= 17.6 ID= 11.1	Packing Gland Bolt Diameter= 7.9 mm
Number of Mechanical Cycles: 750	Packing Compression % of Free Height= 80%
	Torque on Gland Nuts(each side)= 27/27 (ft-lbs)
Number of Thermal Cycles: 750	Mechanical Cycles Prior to Readjustment: Non-applicable
Maximum Test Pressure: 136 bar	Number of Readjustments: 0
Packing Configuration: Graphite + Graphite with inconel wire Number of rings tested: 7 Circle the following Ring shape(square, circular, vee) Solid or split Braided Die formed Spool stock Wire or other reinforcement Corrosion inhibitor &type Other	Show Sketch of Packing Installation-define each ring: 

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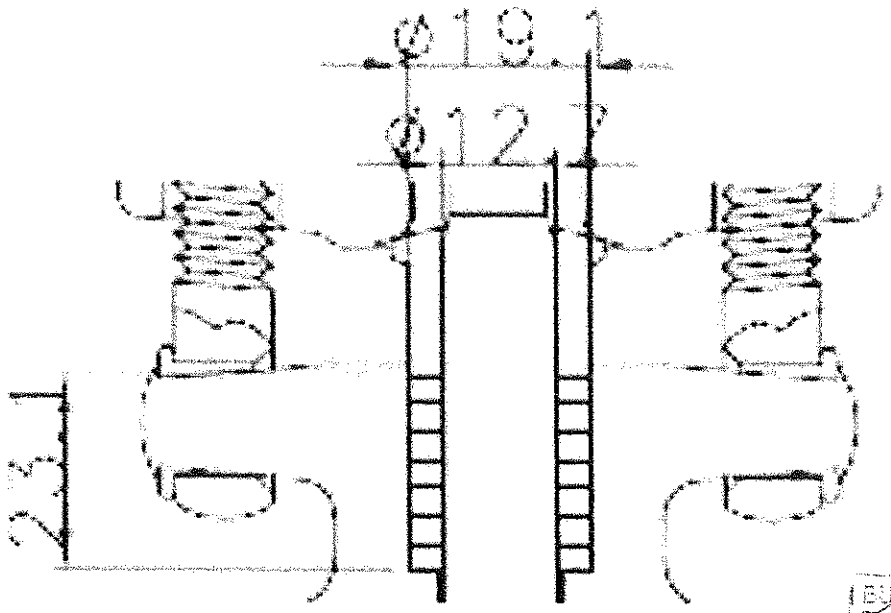
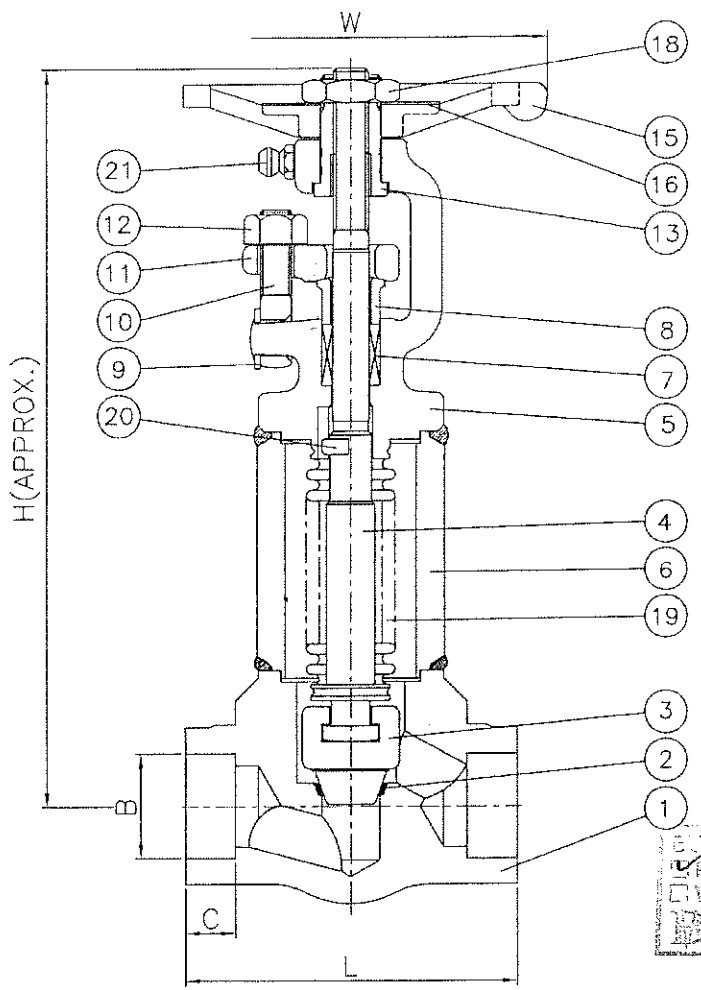
DATE

TEST CHECKED BY :	TEST APPROVED BY :
JONG WOO , SOHN	YONG PYO, CHO
DATE: July 5TH , 2010	DATE: : July 5TH , 2010



Bellows Globe



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ORDER NO. :

BILL OF MATERIALS

NO.	PARTS	MATERIALS	ASTM
1	Body	Forged Steel	A105
2	Seat	Stellite Hardfacing	
3	Disc	13Cr Stainless Steel	A276-410
4	Stem	13Cr Stainless Steel	A276-410
5	Bonnet	Forged Steel	A105
6	Connector	Carbon Steel	A105/A106-B
7	Gland Packing	Graphite + Carbon Fiber	
8	Gland	Stainless Steel	A276-304
9	Ret. Washer	Stainless Steel	A276-304
10	Eye Bolt	Stainless Steel	A276-304
11	Gland Flange	Forged Steel	A105
12	Gland Nut	Carbon Steel	A194-2H
13	Yoke Sleeve	13Cr Stainless Steel	A276-410
15	Handwheel	Malleable Iron	A47
16	Name Plate	Stainless Plate	A240-304
18	Handwheel Nut	Carbon Steel	A563A
19	Bellows	Stainless Steel	321SS
20	Guide Pin	13Cr Stainless Steel	A276-410
21	Grease Nipple	Carbon Steel + Cr Plated	

Hydraulic Test	Shell : 2975 Psi(210 Kg/Cm^2)		
	Back Seat : 2175 Psi(153 Kg/Cm^2)		
	Seat : 2175 Psi(153 Kg/Cm^2)		
Seat of Body	Hardfaced with Stellite #6 on Body		
Disc	Stellited (#6)		
Valve Finishing	Phosphatized		
End Connection	Socket Weld (ANSI B16.11)		

Rev. No.	Description	REV'D	APP'D
3			
2			
1			

SIZE (Inch)	H (Open)	L	W	Port Dia.	End Connection		Weight (Kg)	Q'TY (pcs)	Tag No.
					B	C			
1/2	202	76	102	9.5	21.8	10	2.1	17	
3/4	202	86	102	12.7	27.2	13	2.6	5	
1	233	102	114	17.5	33.9	13	3.4	88	
1-1/2	269	152	140	29.5	48.8	13	7.0	3	
2	351	172	165	35.0	61.2	16	11.7	43	

TITLE FORGED STEEL BELLOWS GLOBE VALVE
CLASS 800 WB OS & Y S.W REDUCED PORT

Refer to	API 602 / BS5352	Fig No.		D.W.G. No.	04033053-01
Drawn by	J.E.PARK	Chk'd by	K.H.JUNG	App'd by	H.G.PARK

CLIENT :

S W I Valve Co., Ltd.

Energy & Process

TYPE APPOROVAL CERTIFICATE FOR 2-P TRUNNION BALL VALVE
No. 940013/3-CT-10

B.V. Job Ref: 3.30.1030.03

Inspection ordered to B.V. by (1) : SWI Valve Co. Ltd.
#1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea

Manufacturer : SWI Valve Co. Ltd., Korea
(1) the addressee of the original of this certificate ;

Description of the Supply / Subject of inspection :

Product : Cast Steel 2-P Trunnion Ball Valve
Size of Tested Valve : 4"
Material of Tested Valve : ASTM A216-WCB
Class of Tested Valve: #600
Stem Diameter : 36.0 mm
Tightness class : below 100ppm
Endurance class : 1500cycles
Temperature range : Room Temperature to +200℃
Packing adjustment number: 0

This certificate covers the whole of the supply: ☒ YES (no more inspection planned) ☐ NO (part of the supply still to be inspected)

Scope of the B.V. Survey :

- Witness for Type Test of Fugitive Emission Test

This supply complies with the following applicable document (s) : (2)

- API 622 Type Testing of Process Valve Packing for Fugitive Emissions

(2) and only for parts of the document(s) which concern the certification or the relevant service provided by Bureau Veritas.

List of enclosures: Test Report for Fugitive Emission Test ---------- 6 Pages

(or reference to enclosed list)
The certificate is valid together with enclosures (if listed). Only pages of enclosures (or parts of pages) which are stamped, are considered as part of this certificate.

Marking and Stamping on the items: None

Particulars or comments:
This is to certify that the following valves have been inspected by Bureau Veritas and found to be satisfactory in The Fugitive Emission Test in accordance with API 622 First Edition, August 2006.

Date of Issuance : 07-July-2010
Date of Inspection : 28 to 30-Jun-2010

Issued by :
Name : K. M. Kim
Sign :

Validated by :
Name : Y. M. Moon
Sign :

Location of Inspection : BV-Korea, Seoul Office

BUREAU VERITAS SEOUL 3 KOREA

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Ad ME 9613b

PROTOTYPE TEST FOR VALVE
ACCORDING TO API 622 FIRST EDITION , AUGUST 2006.

- Fugitive Emission Test equipment specification

1. Manufacturer : SWI VALVE CO. LTD.
2. Address : 1023-2 Gwanyang 1-dong,Dongan-gu, Anyang-si, Gyeonggi-do, Korea
3. Date of Test : 28th June,2010 to 30th June,2010

1 VALVE SPECIFICATION

Valve size & type	2P-TRUNNION BALL VALVE WCB/316+RTFE RF FB 600# 4"
Material of Valve	A216-WCB
Valve class	600#
Stem diameter	36.0 mm
Gland packing type	Graphite Molded Packing
Packing material	FKM+Graphite
Operating torque	292 ft-lbs
Stroke/ Angle	Quarter-turn

2TEST CONDITION

Test pressure	102-88 bar
Test medium	He 99%
Check medium	He 99%
Test temperature	RT/ 200℃
Test equipment	Fugitive emission test equip. manufactured by SWI VALVE CO. LTD.
Leakage measurement equipment	Helium Detector(ALCATEL Model ASM142 series)
Sampling method	Random
Valve repacking before test	0
Insulation of test valve	Heating Jacket used
Actuator	Geared motor

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A.1- Fugitive Emissions Test Report Summary

API Std 622

Fugitive Emissions Testing Report Number: SWI-FET-10

Application Profile : Check One ☑ Rotating ☐ Rising	Manufacturer: SWI VALVE CO. LTD. Description: 2-P Trunnion Ball WCB 600# 4"
Testing Facility: SWI Factory Technician: JongWoo,Sohn Witness: Ki-Man , Kim Start date: 28TH June,2010 Completion: 30TH June,2010	Source: ☑ Manufacturer Date: 10th June,2010 ☐ Distributor Packaged: Indicate New or ☐ New Current Product ☑ Current
Gland Load Information psi. Gland Nut Torque : 39 ft-lbs	
Notes concerning installation instructions	

Testing Profile Details

Test Segment	Leak measurement (500 ppm)	Temperature(℃)	Reference Temperature(℃) at packing gland	Flats Adjusted-Gland Nut Torque ft-lbs	Reference A Height (mm)	
Day1 Start,Ambient 0-250 cycles P=102 (bar)	0	Room temp.	Room temp.	39	44.50	
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
High Temperature 250-500cycles P=88(bar)	0	200℃	176℃			
	0	200℃	176℃			
	0	200℃	176℃			
	1	200℃	176℃			
	2	200℃	176℃			
Day2 Start,Ambient 500-750 cycles P=102(bar)	0	Room temp.	Room temp.			
	0	Room temp.	Room temp.			
	2	Room temp.	Room temp.			
	3	Room temp.	Room temp.			
	3	Room temp.	Room temp.			
	5	Room temp.	Room temp.			
High Temperature 750-1000 cycles P=88(bar)	12	200℃	176℃			
	13	200℃	176℃			
	15	200℃	176℃			
	15	200℃	176℃			
	16	200℃	176℃			
Day3 Start,Ambient 1000-1250 cycles P=102(bar)	8	Room temp.	Room temp.			
	9	Room temp.	Room temp.			
	10	Room temp.	Room temp.			
	11	Room temp.	Room temp.			
	11	Room temp.	Room temp.			
	12	Room temp.	Room temp.			
High Temperature 1250-1500cycles P=88(bar)	15	200℃	176℃			
	16	200℃	176℃			
	18	200℃	176℃			
	18	200℃	176℃			
	23	200℃	176℃			

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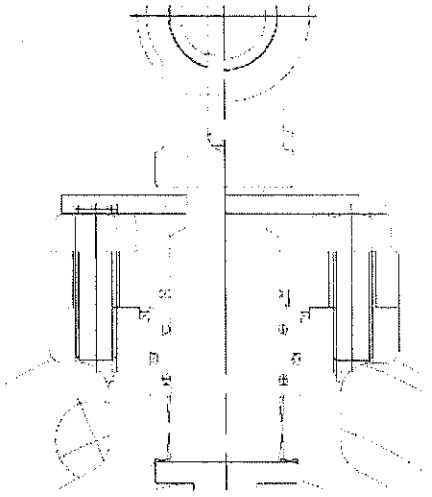
A graph depicting the test profile with associated leak checks and reajustments shall be provide by the testing authority.

API Std 622 Emissions Testing Report Summary	
Test Number: SWI-FET-10	Test Date: 28TH to 30TH June,2010
Packing Material: FKM+ Graphite	Style Number:
Packing Manufacturer: PPE	Source of Sample: 2-P TRUNNION BALL WCB/316+RTFE RF FB 600# 4"
Test Packing Cross-section: (circular)	Laboratory Name: SWI LABORATORY
o-ring / Rectangle	Location of Test: SWI FACTORY
Packing Gland OD and ID(at the packing): OD= 41 ID= 35	Packing Gland Bolt Diameter= 12.7mm
Number of Mechanical Cycles: 750	Packing Compression % of Free Height= 100 %
	Torque on Gland Nuts(each side)= 39/ 39 (ft-lbs)
Number of Thermal Cycles: 750	Mechanical Cycles Prior to Readjustment: Non-applicable
Maximum Test Pressure : 102 bar	Number of Readjustments: 0
Packing Configuration: FKM + GRAPHITE Number of rings tested: 3 Oring + 2 GRAPHITE Circle the following Ring shape(square, circular, vee) Solid or split Braided Die formed Spool stock Wire or other reinforcement Corrosion inhibitor &type Other	Show Sketch of Packing Installation-define each ring: 

TEST CHECKED BY :	TEST APPROVED BY :
JONG WOO , SOHN	YONG PYO, CHO
DATE: July 5TH , 2010	DATE: : July 5TH , 2010

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☑ REVIEWED
☑ WITNESSED
DATE